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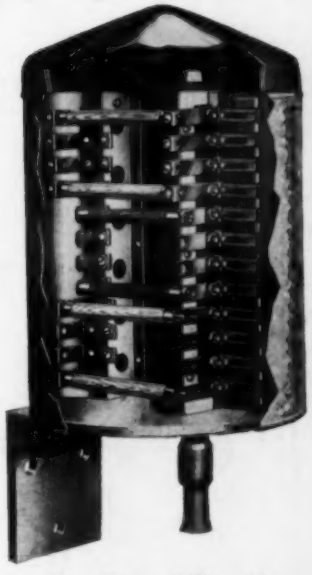

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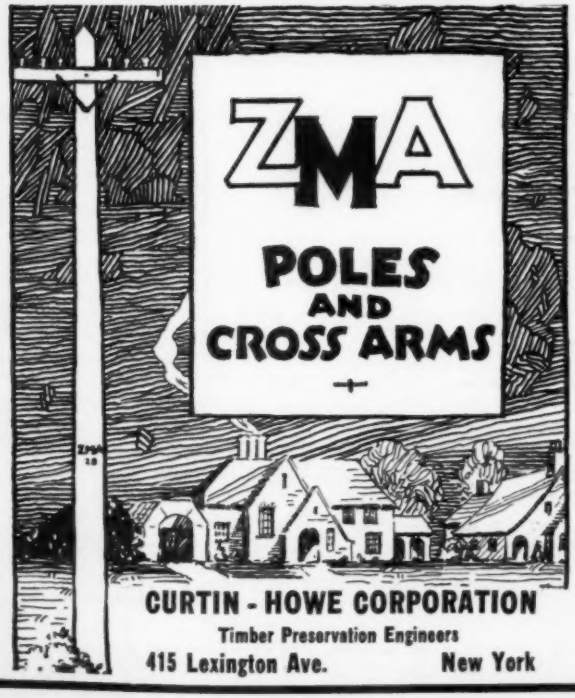

CURTIN - HOWE CORPORATION
Timber Preservation Engineers
415 Lexington Ave. New York

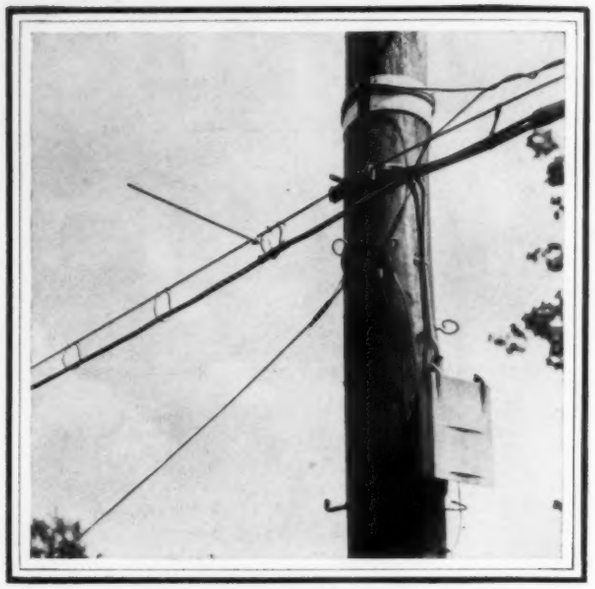

FIGURE 1

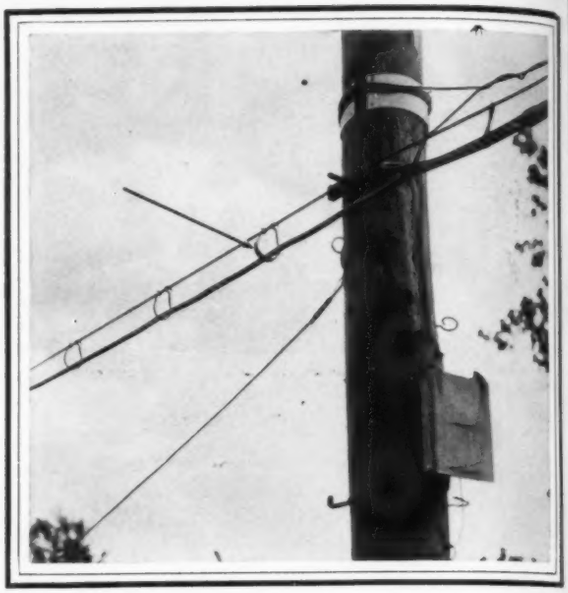

FIGURE 2

Non-Chaffing Cable Ring Saddles

afford

Permanence and Protection

WIRE CONNECTORS

Kearney Solderless Wire Connectors can be used on various sizes of wires and conductors. They are advantageous for temporary and seasonal disconnects; and are most useful where a permanent connection is desired.

PERMANENCE in cable installations can be realized by the use of Kearney Non-Chaffing Cable Ring Saddles. They are clamped to the cable ring so that they always remain in place.

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Figure 1

The old method of protecting cables by stripping junk cable and wiring it in place under the cable ring.

Figure 2

A Kearney Cable Ring Saddle in place. Labor and material considered, approximately three of these saddles can be placed for the cost of one installation such as shown in figure 1.

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Screw Type and Expansion Type Anchors, made of certified malleable iron, guaranteed against breakage; Sleeve Twisters with Interchangeable Dies; Fuse Pullers and Disconnect Sticks; Bullet Type Expulsion Porcelain Plug Cutouts; various voltages and amperages of Fuse and Disconnect Switching Equipment.

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SPECIAL TELEPHONE EQUIPMENT

TELEPHONE ENGINEER, July, 1930. Volume 34. No. 7. Published monthly by TELEPHONE ENGINEER. Publication office, 192 N. Clark St., Chicago, Ill. Subscription price, $2 a year in the U. S. Entered as second-class matter June 6, 1922, at the Post Office at Chicago, Ill., under act of March 3, 1879.

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Here are only a few of those who are good prospects for telephone typewriter service

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Between airports.

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Between main office and yards.

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THE TELEPHONE TYPEWRITER

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Position.....

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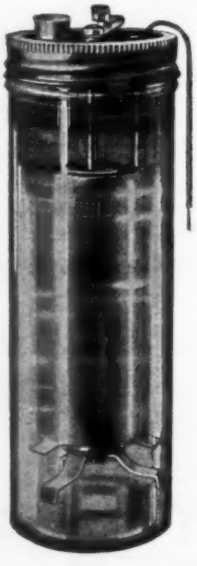


A MODERN TELEPHONE CELL

—

For Long Dependable Service

THE WATERBURY BATTERY COMPANY
WATERBURY, CONN.

Telephone Engineer

Volume 34 JULY, 1930 No. 7

Public Relations

The aim of every successful company is to handle all of the relations with its customers in an efficient, personal and convincing manner.

The telephone business is one of continuous service and the industry is dependent on the good will of the community they serve. In every contact that an employee makes with a patron, good will is either developed or ruined by his personality and manner of transacting the business at hand.

During the time of disaster and trouble, the fine spirit of devotion to duty is shown by the telephone men and women in rendering first aid and special service to the public; however, it is seldom that we have the occasion of learning just what our patrons truly and sincerely think of our company and its efforts to render real service to them. Too frequently the only time that we learn our patrons' thoughts is when our service has not been all that might be desired and we are told about it curtly. How important it is at a time like this that the employee be well trained in courtesy and cheerfulness.

Roger W. Babson, noted economist, says: "No public utility company can afford to employ a man or woman who ever loses his or her temper, or who is even "sassy" or "fresh." All public utility employes must have calm, even dispositions. It is no business for hot-headed people to enter."

Work in the business office may be classed under two headings, contact and clerical. For years commercial employees have been trained from the clerical angle, since that angle seemed the most important and only a few far sighted managers realized the importance of proper contact with the public. In a business interview for the telephone company, an error on the company side means a dissatisfied customer, which is more than too bad when everyone knows that the aim of the company was to make him a satisfied customer and that he would have been satisfied if he had been well handled.

Many commercial departments are now teaching its interviewers, all of its representatives who make contact or meet the public, to get the customer's viewpoint. Some of our larger offices use observers whose duties are not merely to point out where the wrong thing is said, but to see that the customer must always get what he wished for or was entitled to in a courteous attentive manner, in as short a time as possible.

It is imperative that we employ people who have a good disposition and who can be trained to be kind and tactful and who will be ever willing and anxious to serve the public at all hours of the day and night.

While training is necessary, it is not so essential as the possession and development of a pleasing personality.

Maintenance and Data Books

Many, many times at State and National telephone conventions, well-informed telephone executives have discussed with the writer the very definite need for authentic information regarding the equipment and standards to be used in the telephone plant.

Countless books have been written on the theory and design of telephone plants and equipment. But little has been done in the way of issuing practical instructions along the lines of maintenance and upkeep of the equipment, which can be understood readily by wire chiefs and plant men.

It therefore is with gratification that we have just read and studied pamphlet 261, "Maintenanace of Distributing Frames," by T. DeWitt Talmage, transmission engineer, Illinois Telephone Association. This pamphlet explains methods of inspecting distributing frames and tells how to keep them in proper working condition. It is an unusually valuable instruction bulletin and we suggest that you provide all wire chiefs and inside plant men with copies.

The United States Independent Telephone Asso-

ciation is to be given due credit for its standardization of accounting and record methods in the telephone business office. However, if we are to achieve ideal operating methods, there must be standardization both outside and inside the plant. Fully as important and necessary as the equipment itself are clear and concise pamphlets and bulletins on the maintenance of this specialized apparatus.

Telephone Engineer has as one of its chief interests the standardization of plant methods. The telephone industry is served by a large group of individual companies, such as switchboard manufacturers, cable manufacturers, manufacturers of telephone protective apparatus, jobbers of poles, wire and many other materials. We suggest that manufacturers who are leaders in their respective lines should not wait for outside engineers to write their bulletins. They should forge ahead, and subsequently become themselves the foremost authority on the maintenance and upkeep of their particular product.

Home Ownership an Asset

It is usually a matter of pride with a man when he reaches the point where he owns his own home. Employers are pleased when a large percentage of their employees are home owners. Cities advertise the fact that large numbers of citizens own the property in which they live. Home ownership usually makes for prosperity and stability of the worker, of industry, and of the community.

We have no figures to prove it, but our impression is that telephone employees will rank well up with other classes of citizens in home ownership. We wonder if the same thing can be said in regard to telephone companies, especially in the smaller communities.. Of course, in larger cities the special requirements of telephone building are such that rental property can seldom be adapted for telephone use.

Too often in the past, telephone companies have rented quarters with the sole idea of keeping down expenses. Quarters have been neither attractive nor convenient. May we ask how any town can be expected to be proud of its telephone service when the office of the telephone company is located in an upper back room of a tumble down building and is approached through a dirty, dimly lighted stairway and hall.

Some such conditions still exist, but happily they are becoming fewer. More and more we are hearing of companies moving out of rented quarters into buildings designed and built for their special use. Some of the buildings now being built for smaller offices, while not of extremely expensive construction, architecturally take a high rank. They are real improvements in the towns where they are being built. What the telephone industry needs is more of them. Any company planning on replacement of its central office equipment can well consider the policy of owning its own building.

Tariff Affects Telephone Industry

A new tariff bill, known as the Hawley-Smoot Tariff Act, became an accepted measure during the past month. Although President Hoover admits that the bill is not perfect, he has taken the stand that the uncertainties caused by protracted tariff debates could have been ended only by the passing of this bill. He further states that any inequalities can be remedied within a reasonable time by the flexible provisions, and that the bill is a highly commendable progressive step in that it takes the tariff away from politics.

Enemies of the president state that it would have been impossible for a president to veto a tariff that had been sent to the White House by his own party. However, along with the chorus of disapproval from democratic and independent parties, a number of influential republican leaders have criticized the president's action, asserting that our foreign relations will be dangerously affected by the tariff act.

Protests from many nations already have been sent to Washington, indicating the alarm and resentment the tariff has aroused among the leading merchants and manufacturers of other countries. We hear reports of campaigns launched in several European countries, to educate their people not to buy American goods. Many American industries which have come to rely upon their export trade as a means to keeping their plants running at full capacity, anticipate dire effects from the tariff.

If the United States attempts to sell Europe and at the same time is determined not to buy abroad, she is bound to sooner or later get a bad taste in her mouth, as well as bad money in her pockets, as the result of such discrimination.

No great telephone project is started in any part of the world without engineering and financial backing from America. Many millions of dollars in telephone equipment and supplies are shipped annually from this country.

The telephone industry is proud of the great system which links together all the telephones of the world. We cannot help but feel how much more desirable it is to work toward these mutual goals which make for international friendship, rather than to set up high hurdles for our already over-burdened foreign friends to jump.

And we are not entirely unselfish in our views. For as the world prospers, so it follows that the United States prospers, and accordingly, individual industries prosper.

Testboard Theory and Practice

Readers of Telephone Engineer Will Be Pleased to Learn That Mr. B. C. Burden, Foreign Wire Relations Engineer, Lincoln Tel. & Tel. Co., Will Contribute Several Articles During the Year—This Is His First

General

Some arrangement for testing local and toll lines from the central office is essential in every telephone exchange.

It is true that trouble can be located by the "hunt and find" method, but such practice increases both maintenance costs and subscribers' complaints.

Adequate testing equipment permits both the source and character of a case of trouble being quickly determined so that a troubleman can be sent directly to the proper point to clear it.

Telephone exchanges may be divided into three classes with respect to their testboard requirements, viz:

No. 1—The small magneto or common battery office with only a few hundred lines can manage nicely with a portable continuity tester (voltmeter and dry cells mounted in carrying case) or with a small d. c. voltmeter mounted on or near the switchboard and arranged to be connected to the main frame or switchboard jack by means of a testing shoe or test plug.

No. 2—The larger magneto or common battery offices having from 400 to 1,000 lines should be equipped with a wire chief's testing turret, or wire chief's test desk. Where there is considerable cable to be maintained (especially if underground or buried) a wheatstone bridge is usually justified.

No. 3—Common battery manual or dial offices with over 1,000 lines will generally require a multi-position test board, depending, of course, on the number of toll lines and superposed telegraph facilities which are terminated for test. In large multi-office exchanges separate test boards are provided for toll and exchange testing.

The above classifications are of course arbitrary and merely suggest reasonable practices in exchanges of various sizes. Inasmuch as toll and exchange circuit testing is usually handled from the same board in the small exchange the number of toll circuits terminated will determine to a large extent the type of testing facilities required.

Various Tests

Before proceeding with the discussion of the circuit arrangements in testboards let us first consider the kinds of tests which we may desire to make in connection with fault location or circuit maintenance.

These tests are designated, in the following list, according to the type of office (mag., c. b., or auto.) for which they may be applicable. They are:

No. 1—Voltmeter continuity tests for opens or high resistance faults. (mag., c. b., auto.).

Convention Schedule

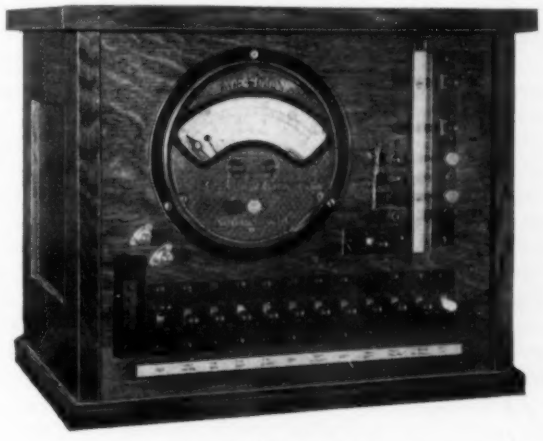
Wisconsin State Telephone Convention, Schroeder Hotel, Milwaukee, August 5th, 6th and 7th.

United States Independent Telephone Association, Stevens Hotel, Chicago, October 14th, 15th, 16th and 17th.

Illinois Telephone Association, Hotel Pere Marquette, Peoria, November 12th and 13th.

No. 2—Voltmeter continuity tests for short circuits in lines or equipment. (mag., c. b., auto.)

No. 3—Voltmeter continuity tests for crosses between circuits. (mag. c. b., auto.)



Kellogg cabinet type tester

No. 4—Voltmeter continuity tests for grounds or high resistance leaks. (mag. c. b., auto.)

No. 5—Voltmeter test for foreign potentials. (mag., c. b., auto.)

No. 6—Subscribers subset condenser tests. (c. b., auto.)

No. 7—Insulation break down tests. (large C. B. and auto. ex.)

No. 8—Transmission tests. (mag., c. b., auto.)

No. 9—Transmitter current flow tests. (C. B. and auto.)

No. 10—Dial speed tests. (Auto.)

No. 11—Wheatstone Bridge tests where required for the accurate location of faults in cable or toll circuits. (mag., c. b., auto.)

Testboard Circuits.

The principal apparatus items on a test board are a d. c. voltmeter-milliammeter, a wheatstone bridge, dial speed indicator (auto. exc. only), and an arrangement of keys and jacks for setting up the various tests. Trunk circuits to the switchboard and m. d. f. are also provided for connecting the test circuit to the subscribers line. Two circuits are generally terminated on "in and out" jacks either in the wire chiefs testing panel or in a separate cabinet. This is necessary in order to be able to test around the phantom coils usually present on toll lines.

The voltmeter is the instrument most frequently used in testing work as it enables quickly determining the type of fault as well as its approximate location. When it is desired to know the exact location of the source of a case of trouble a more accurate testing arrangement such as the wheatstone bridge is required.

The theory of testing by means of a voltmeter in series with a battery is based on the fact that the approximate resistance of any circuit completed through the testing terminals can be determined by subtracting the voltmeter reading from the test battery voltage, and dividing this result by the voltmeter deflection and multiplying by the voltmeter resistance. Stated in equation form this relation is:

$$X = \frac{E - V}{V} R$$

Where:
X—resistance connected to test terminals.
E—test battery voltage.
V—voltmeter deflection in volts.
R—voltmeter resistance in ohms.

If it were possible to have a testing voltage which never varies then it would be feasible to calibrate the meter to read directly in ohms. Meters are available which are direct reading, however, best practice seems to indicate the use of the voltmeter scale preferable. The incon-

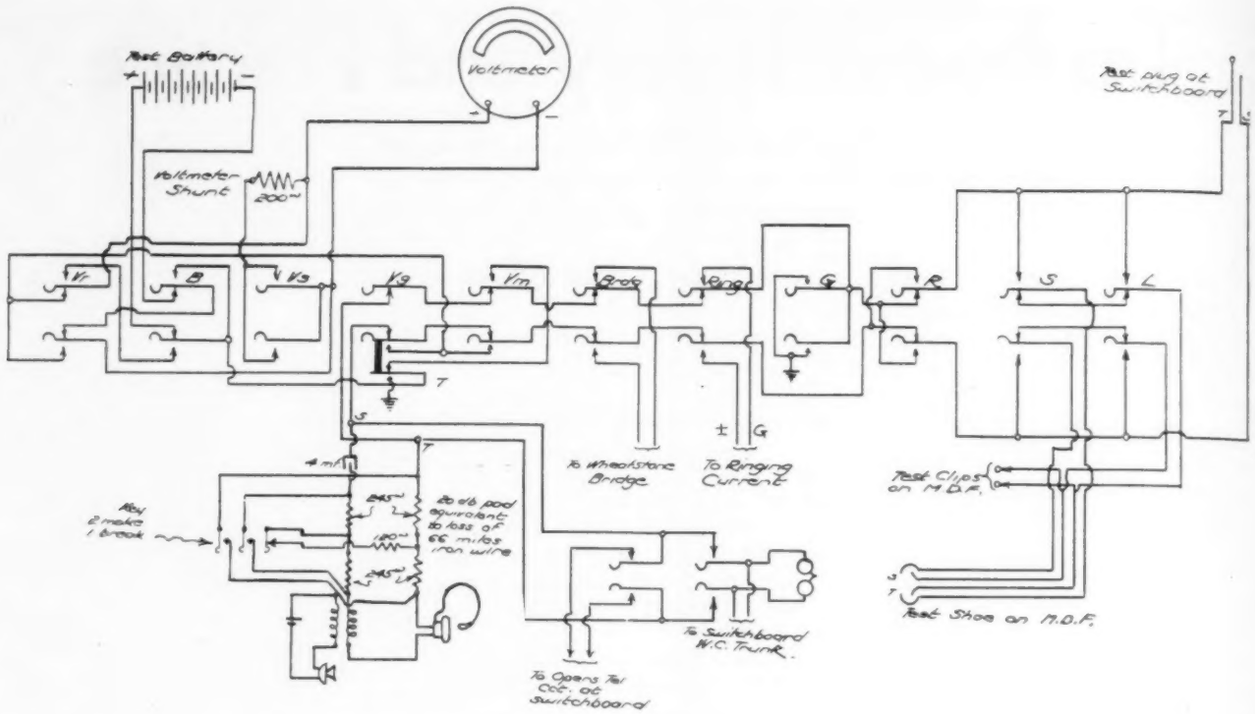


Fig. 1—Typical wire chief's test circuit for small and medium size offices

venience of having to use the formula for each reading taken can be eliminated by preparing a conversion chart which gives the corresponding resistance for any voltmeter deflection for several different values of voltage on each side of the normal testing voltage.

The voltage of the test battery at the time of making a test can be determined by shorting the tip and ring of the testing trunk.

The larger test board installations are usually equipped with combination volt-milliammeters so that the milliammeter scale may be used for measuring the current flowing to a subscriber's transmitter (C. B. lines).

The milliammeter is also useful in measuring low resistance faults such as wet cords, receivers off the hook, line shorts, etc.

The formula for computing resistance when using a milliammeter in series with a battery is:

$$X = \frac{E}{I} - R_1$$

Where:
X—unknown resistance.
E—test voltage.
I—current in amperes.
R_1—total resistance of test circuit.

Low resistance ranges can also be obtained by shunting the voltmeter with a resistance of suitable value. As an example, a 10,000 ohm meter with a 30 volt scale will have a range of from 169 to 500,000 ohms unshunted but with a 200 ohm shunt the range will be reduced to 3.3 to 11.564 ohms. It should be noted that the resistance range does not mean that any resistance value in this range can be determined accurately, for as a matter of fact, the greater the range the less accurate and the more difficult will it be to read low resistances.

The most accurate reading is obtained when the resistance of the voltmeter is approximately equal to the resistance being measured.

Voltmeter and Milliammeter Tests.

A suitable testing circuit for the small and medium size offices is shown in figure 1. This circuit utilizes a 10,000 ohm Weston voltmeter with a 30 volt scale. The various tests which can be made with this circuit are shown in figure 2.

You will note that the testing circuit is arranged to be connected to the subscriber's line either by means of a test plug located at the switchboard or with the test shoe located at the m. d. f. Two flexible cords with test clips attached are also connected to the tip and ring of the test circuit and are located at the m. d. f. for use in testing vacant cable pairs by clipping on the punchings at the terminal block.

An order wire circuit which connects the wire chief's telephone circuit directly to an operator's head set is provided for convenience in ordering up the test plug. This circuit is typical of the wire chief's testing turrets offered by the different manufacturers.

The chief difference in the testing circuit when used on common battery plants as compared to magneto is the provision of a key which may be operated to feed battery out to the subscriber's line being tested.

Insulation Tests.

In connection with toll line testing it is desirable to make periodic tests to determine the insulation resistance between wires and from wires to ground.

These tests are necessary to uncover excessive leakage due to bad tree conditions, defective insulators, etc. Although the low insulation conditions are usually concentrated at specific points along a toll line it is customary to make overall measurements of the resistance to ground, and between wires and then from this reading assign an insulation per mile value. For example, if a toll line 50 miles long gave a resistance reading when connected as shown in figure 2 of 100,000 ohms then the insulation resistance per mile of line (to ground) would be 100,000x50 or 5,000,000 ohms (5 megohms). The insulation resistance between wires is measured with the distant end open and the value per mile obtained in the same way. Best present day practice indicates that toll lines should be maintained with insulation resistance values per mile of 25 megohms.

Transmission Tests.

Transmission tests can best be made by talking tests between the subscriber's subset and the test board with a 20 d. b. (equivalent to 20 miles No. 19 gauge cable approx.) pad inserted in the talking circuit.

The purpose of the pad is to increase the overall circuit equivalents to some value approaching 30 d. b., as it is generally recognized that small differences in the volume of transmission are much more easily observed when the equivalents of a talking circuit approach the limiting values.

In making talking tests it is desirable that the test be made with a troubleman at the subscriber's set rather than the

subscriber in order to get an accurate test. The troubleman should be instructed to talk in a uniform manner so that tests on different subsets will be comparable.

The pad shown in figure 1 is generally not a part of the testing equipment found

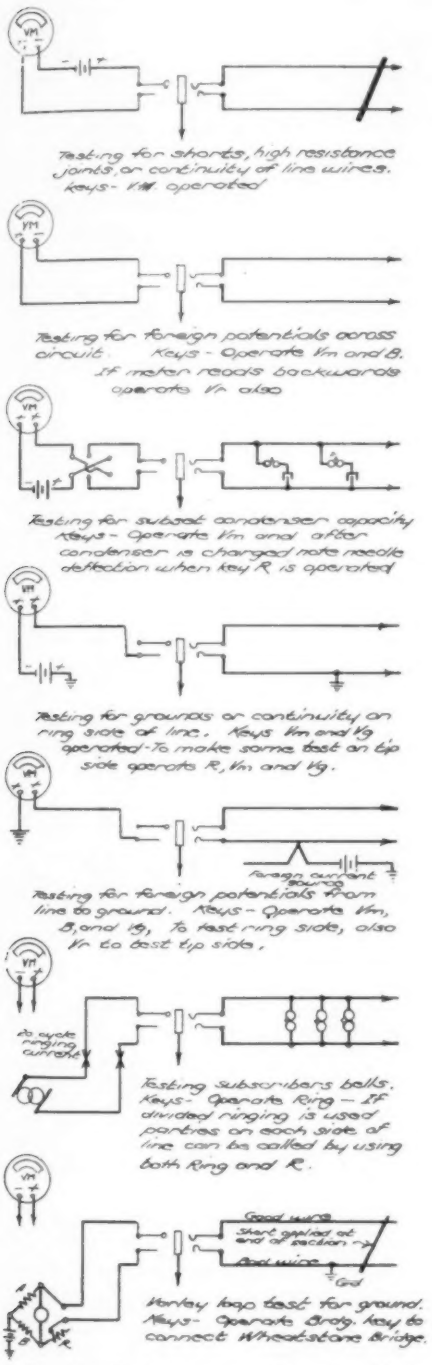

Testing for shorts, high resistance joints, or continuity of line wires. Keys - Vm operated
Testing for foreign potentials across circuit. Keys - Operate Vm and B. If meter reads backwards operate Vn also
Testing for subset condenser capacity Keys - Operate Vm and after condenser is charged note needle deflection when key R is operated
Testing for grounds or continuity on ring side of line. Keys Vm and Vg operated - To make same test on tip side operate R, Vm and Vg.
Foreign current source
Testing for foreign potentials from line to ground. Keys - Operate Vm, B, and Vg, To test ring side, also Vn to test tip side.
Testing subscribers bells. Keys - Operate Ring - If divided ringing is used parties on each side of line can be called by using both Ring and R.
Good wire
Short grade at end of section
Bad wire
Ground
Varley loop test for ground. Keys - Operate Brdg. key to connect Wheatstone Bridge.

Fig. 2—Various tests with wire chief's test circuit

on typical wire chief's testing turrets but it can easily be wired into any testing circuit and is recommended to all companies not already equipped with this testing arrangement.

It is the practice in the larger central offices to adjust the value of the current flowing to the subscriber's transmitter to some normal value before making a talking test. The magnitude of the current is measured by a milliammeter in series with the battery feed circuit and regulated by means of a series rheostat.

This feature is not of sufficient value in the small office to warrant adding equipment for it, as satisfactory tests can be made with pad alone. It is desirable however, to be able to measure the value of the current taken by a C. B. transmitter. On existing testing turrets this can be arranged for by mounting a small flush type Weston Model 301 milliammeter at the side or on the panel of the testing turrent and wiring it into the circuit.

By noting the value of current taken by transmitters on the various length loops the tester soon becomes familiar with the approximate current any transmitter should draw and will therefore readily pick up poor transmission cases caused by transmitters which draw less

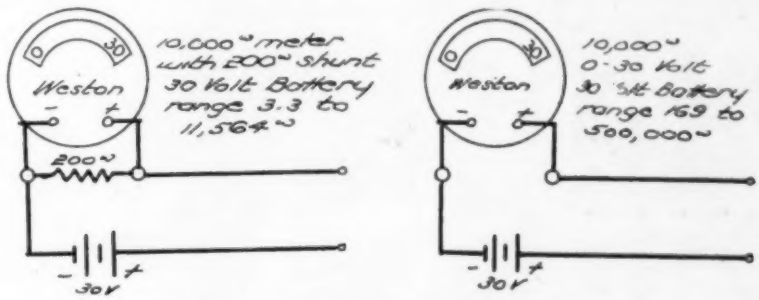

Weston
10,000 ω meter with 200 ω shunt 30 Volt Battery range 3.3 to 11,564 ω
200 ω
30 V
Weston
10,000 ω 0-30 Volt 30 Volt Battery range 169 to 500,000 ω
30 V

Fig. 3—Use of shunt for low resistance measurements

or more than the normal amount of current.

Insulation Break Down Tests.

Insulation break down tests are a part of the testing routine in large exchanges but are usually not necessary in the small exchange.

Tests of this nature are necessary to insure that equipment at the subscribers station or in the central office can withstand the normal operating voltages without the insulation breaking down.

These tests are made by impressing a high voltage (200 volts) across the circuit to be tested and noting the reading on a milliammeter which is in series with the testing voltage.

In both small and large exchanges of the automatic type dial speed tests are desirable to insure the satisfactory operation of the automatic equipment.

These tests are made by means of a mechanical-electrical device which is mounted on the test board and which consists essentially of spring driven escapement which is started and stopped by the first and last impulse when number 0 is dialed from the dial under test.

The escapement is adjusted to release an indicator which travels over a calibrated scale at the rate of 10 pulses per second. The speed of the dial being tested is determined by reading directly from the calibrated scale the pulses per second as indicated by the distance traveled by the indicator while the dial is making 10 pulses.

Every office should have a systematic routine for handling trouble calls. In the small and medium sized offices a good plan to follow is this: Whenever an operator observes a case of trouble or receives a subscriber's complaint she should record the details of the trouble and subscriber's number on a trouble ticket (with carbon copy). These tickets are immediately passed to the wire chief. The wire chief upon receiving the ticket orders the subscriber's line connected to his test circuit and then makes the regular voltmeter tests to determine the approximate location and type of trouble. After the trouble is diagnosed the carbon copy is filled in with the cable pair count and terminal feed location and given to a troubleman who "gets the trouble."

When the trouble is cleared and reported back to the wire chief he indicates on the original trouble ticket the nature of the trouble and then files the ticket. The tickets are anaylzed monthly to determine chronic conditions which are the cause of recurring trouble and which should be permanently taken care of by extensive repairs or new construction.

The large operating companies maintain card records which show subscribers telephone numbers, address, type of subset, cable pair count, and terminal feed. Space is also provided for recording each case of trouble occurring to the subscriber's line or subset.

Summary.

Inasmuch as telephone service is judged principally by transmission and reliability of service it is evident that the testing of subscriber's lines so as to enable the prompt location and clearing of trouble is a most important function. Are your testing facilities adequate, and equally important is testing technique fully understood by those in charge of this work? If your testing circuit does not include the 20 d. b. pad discussed in this article then by all means you should consider installing this arrangement in the testing circuit at once. Within the past year a large number of companies have adopted this form of transmission test and find that it is a real aid in eliminating poor transmission complaints.

Straight-Forward Trunking System

This Article and the Series to Follow Written by John H. Levis, Jr., Telephone Engineer, Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.

The straightforward trunking system about to be described is the Stromberg-Carlson system as installed in the offices of the Rochester Telephone Corporation of Rochester, New York.

The positional "B" Keyboard is laid out on the basis of forty plug ended straightforward incoming trunks with associated single lamp for each trunk. Each plug has placed behind it an individual number plate numbering its location in the group.

In front of the trunk plugs is a continuous designation strip for the proper trunk numbers as per the traffic or plant departments. Next comes the trunk lamps, one per trunk. The lamp caps have the nsual white, red and green colors and the same applies to the cords. The plug shells have gray, red and black. All of this equipment just outlined is on the plug shelf.

The plug shelf is placed on a 25 degree angle so that the plugs will point out towards the operator, allowing greater accessibility to the plugs when the position is being operated. Cords that lay across the keyshelf toward the operator will return to the plug shelf much easier.

Fig. No. 1 shows "B" board at the Monroe exchange of the Rochester (N. Y.) Telephone Corporation

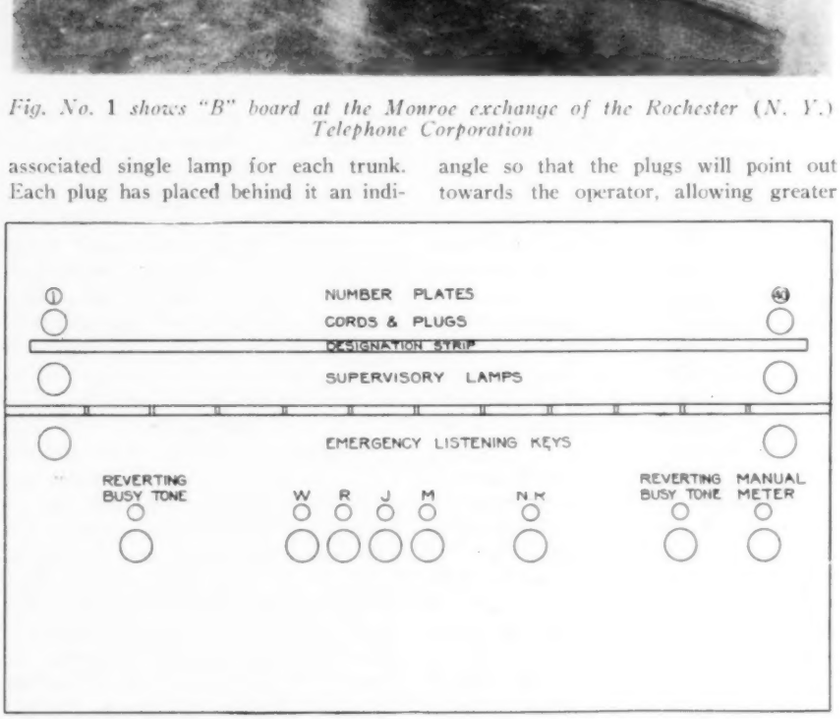


Fig. No. 2 shows complete plug and keyshelf in straightforward trunking system

The cords, when up and in jacks, slant toward the face of the switchboard jack field, therefore giving a decided clearance to pick out plugs from the plug itself. Should some of the cords that are up in jacks hook around the plugs on the front side, the operator lifts the cord off and it then falls back of the plug. This feature shows an advantage over the vertical position of plugs.

The signal lamps or supervisor lamps are also on a slant which have a tendency to show up clearer to the operator being in a direct line of vision.

The key shelf proper is flat and next to the hinge line are the emergency or supervising listening keys (one per trunk). These keys are of the flush, small push button type and are non-locking.

Fig. No. 3—Slanted plug shelf view in straightforward trunking system.

The buttons are also colored white, red and green to correspond with the cord color scheme.

Slightly back of the cut-in keys are the common ringing selecting keys of which there are four, each one representing a different frequency selection such as W. R. J. M. These keys are centrally located and spaced on fifteen-sixteenths inch centers.

The non-ring or re-establishing key is mounted in the same row as the ringing selecting keys but slightly more to the right.

These keys are of the flush non-locking type and are white. The finger surface is five-eighths of an inch in diameter.

There are two reverting busy tone

(*Continued on page 40.*)

Recent Developments in the Creosoted Pine Pole Industry

An Address by R. E. Meyers, in Charge, Department of Chemistry and Tests, International Creosoting & Construction Company, Galveston, Texas

Recent years have seen a marked expansion in the use of creosoted pine poles over the entire country. Among the various species they have moved steadily upward, until now more creosoted pine is used annually than any other kind of pole.

Use of Creosoted Pine Increasing

A copy of the 1928 U. S. Department of Agriculture statistical tabulation is given below[1]:

Kinds of wood.	Full-length pressure treatment.	Butt treatment only.	Total.
South. pine..	1,528,441	.....	1,528,441
Cedar:			
West. red..	536	1,254,613	1,255,149
North. white		555,921	555,921
Port Orford	225	8,658	8,883
Chestnut	100	284,624	284,724
Douglas fir..	17,375	417	17,792
Lodgepole pine	3,000	410	3,410
All other....	565	.....	565

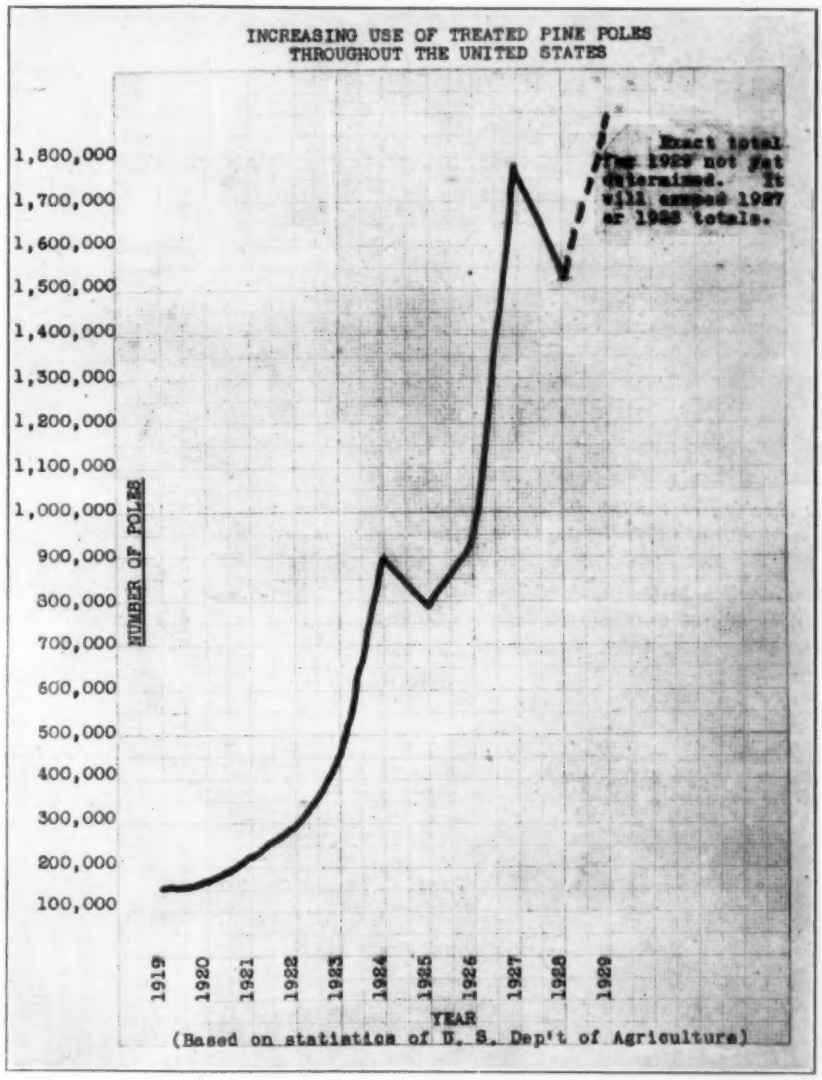
Certain factors pertaining to this trend in the utilities industry, particularly with regard to developments of the past two years, are outlined in this paper.

New Publication Compares Strength of American Woods

In February, 1930, the United States Department of Agriculture issued Technical Bulletin No. 158, *"Comparative Strength Properties of Woods Grown in the United States.* This publication gives comparative figures which are index numbers to the relative strength of the various kinds of wood. The technical values have been combined into simplified comparative figures, subject to ready interpretation and application. The following strength relationships of species commonly used for poles are quoted from Technical Bulletin No. 158:

SPECIES OF WOOD.	Index number indicating relative strength of the species.
Longleaf pine	106
Shortleaf pine	97
Loblolly pine	93
Chestnut	68
Western red cedar.....	60
Northern white cedar.....	50

Taking the Southern yellow pine group as 100, Northern white cedar is 50.7 per cent, Western red cedar is 60.8 per cent, and chestnut is 68.8 per cent, as strong as Southern yellow pine.



This graph illustrates the trend of the utility industry in the use of poles

While the foregoing is based on tests of small clear pieces and therefore is not directly applicable to poles, the figures do represent the best authoritative published index to the *relative strength* of the pole woods. The American Engineering Standards Committee has been conducting an intensive study of actual pole tests and will later release figures giving modulus of rupture data as determined by these tests. These figures are not now available, but when published should be recognized as standard for fiber strength of the pole woods. In line construction practical advantage is taken of the great permanent strength of creosoted pine in one of two ways—either by using smaller poles, or by using longer spans than when building lines with woods of other kinds.

Empty Cell Treatment Now Almost Universal

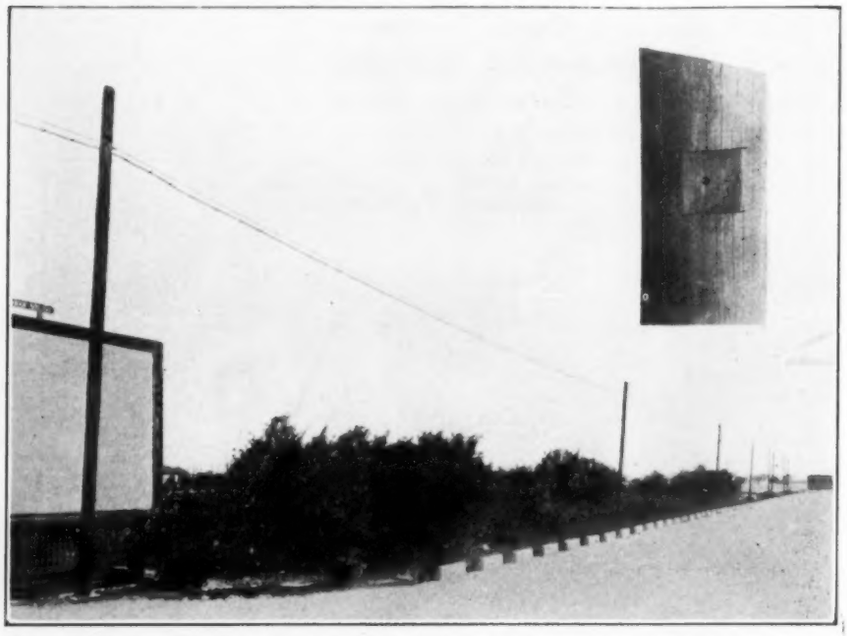
As to developments in treating processes, one of the largest users of poles, the Bell System, changed last year from 12 lb. full cell to 8 lb. Rueping empty cell

treatment, the treatment that for several years has been used by the majority of independent telephone companies for city, rural and toll pole lines.

In this latter process, the poles come from the treating cylinders with the wood cells partly empty, whereas the former process left them full of creosote

pole for use on city streets.

From the standpoint of the creosoted pole manufacturer, it has the further advantage that the treating industry by reason of the purchaser's demands instead of having two treatments is able cause of a deeper penetration of the creonow to present a solid front, in that for



Less checking at the top, better drainage of moisture, and less loss of preservative through evaporation, are causing this roof to be used increasingly by utility companies. Angle is 15 degrees.

The result is a better protected pole besote, a more even distribution of the preservative per pole, and a dryer, cleaner

pole treatment, 8 lbs. of creosote treated by the Rueping empty cell process is used in the vast majority of cases. (Where pole lines go through swamp-lands, or under climatic conditions similar to those of the tropics, consideration should be given to the use of a greater quantity of creosote per cubic foot of wood.)

Termites Now Found in All But Three States of the Country

We wish to call attention to the increasing serious depredations of termites or white ants. A recent government report announced that termites have now been found in all but three states of the Union, namely North Dakota, South Dakota and Vermont. So prevalent are these attacks that the writer will make the rather broad assertion that within half a day after hearing a statement of this kind, any group interested in timber treatment can be shown white ant attacks in untreated wood in active service. This of course excludes the three states named.

It seems that with the thinning out of the forest areas, which are the natural habitat of the termite, they have sought other shelter and as a result dwellings and untreated pole lines are attacked. Termites work rapidly and dangerously; often there is no outside indication of their presence. In some severe cases, at Beaumont, Texas, for example, untreated poles collapsed in three years from this cause.[3]

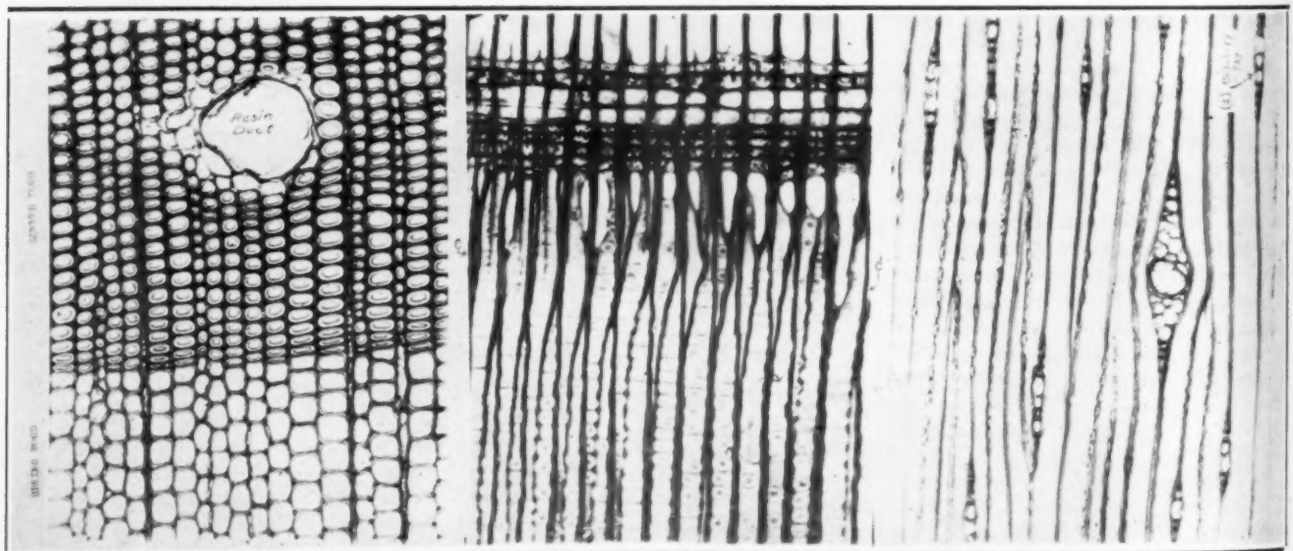
Not only are lines damaged, but the poles act as direct highways by which an infestation can spread from one section to another.[4]

Government tests have established that the creosoting of wood protects it for

PINE UNDER THE MICROSCOPE

(Magnification 250 diameters)

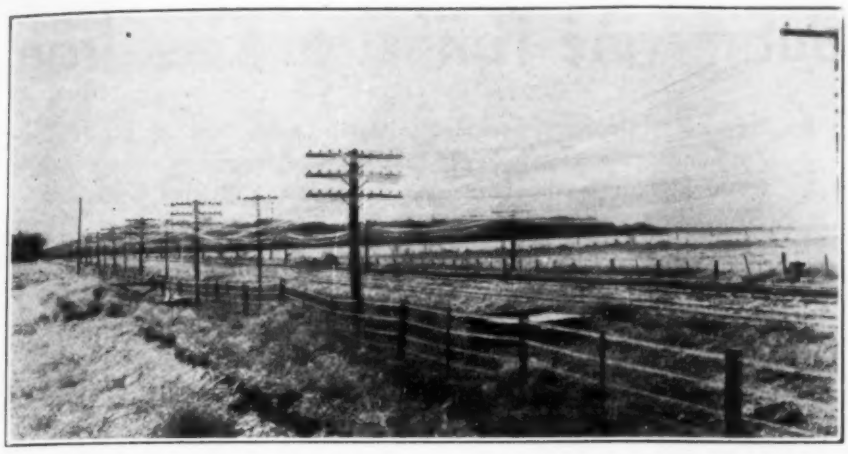
Cross Section *Radial Section* *Tangential Section*



Wood is composed of individual cells. Pine is the strongest of the commonly used pole species. Note its tube-like structure. (Cross section shows wood-cells as viewed endwise.) The resin ducts carry and store resin in the living tree. During treatment they act as important passageways for the preservative.

The radial section shows the wood cells as viewed lengthwise. Note the perfect interlocking of the series of cells between C and C¹. Pine is flexible yet exceedingly high in strength. The bordered pits (b) are minute openings in the cell walls—valves by means of which the preservative moves sidewise from cell to cell.

Again showing the tube-like wood cells viewed lengthwise. In Rueping empty-cell treatment, a large quantity of creosote is forced into these cells, thus giving a deep penetration of the preservative. Toward the end of the treating process the excess preservative is withdrawn, leaving the wood-cells partly empty. A gross injection of 16 to 20 pounds of creosote is obtained, when only 8 pounds of creosote per cubic foot are left in the wood.

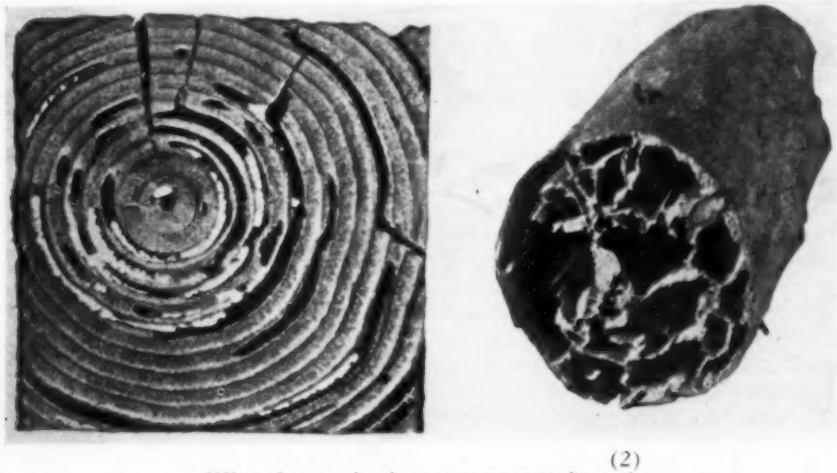


Under conditions such as are shown here, the strength of the creosoted pine pole is apparent

at least 20 years from termite attacks.[5] An N. E. L. A. report[6] states that "So far as is known, termites have not attacked a creosoted pole by eating their way through creosote."

New Roof Retards Checking and Affords Better Drainage

A new type of roof for poles is receiving increasing notice. It is illustrated on the foregoing pages. This roof drains water better than the type usually used, and it can be applied at lower cost than the former roof. With this type, poles check less at the top.



(2)

What the termite does to unprotected wood

Creosoted Pole Industry Has Modern Merchandising Set-Up

One of the greatest changes of the past several years has been in the merchandising set-up for pine pole purchases. It was not infrequent a few years ago, on any sizable pole order, for delivery to be deferred sixty to ninety days. Proper deliveries on extensive requirements almost necessitated the buyer's commitments to a yearly contract basis; or the utility company's carrying a large stock on its own pole storage yards. Today in line with the "hand-to-mouth" purchasing policy that successfully prevails in so many industries, the utility company purchaser, also, finds it possible to place pole orders in any quantity for immediate shipment; *and get such shipment.* His carrying of pole stocks is no longer necessary, for he finds that the properly set-up creosoter can frame and then treat any ordinary order for poles and have it on outbound cars in twenty-four working hours.

(You will note that framing is mentioned before treatment. Never permit the reversal of this order of plant operation. Framing should *always* be done before treatment. Thus untreated areas are not opened to infection; and also the pole reaches the line ready to go into the ground.)

Pretreatment

This matter of framing brings us to another development of the treating industry—called pretreatment of poles. This development was originated by one of the creosoting companies in order to meet the demands of the utilities industry for creosoted pine poles on a quantity — quality — prompt - shipment basis. Briefly the process is this: the untreated poles, seasoning on the creosote plant yard reach the point where they are ready for treatment. If there are no orders on which they then apply (and it is literally impossible to perfectly mesh "seasoning" and "out-bound orders") the poles are treated Rueping empty cell with 4 pounds of creosote final retention per cubic foot. They can then go back to the storage yard perfectly protected against season-decay by the 4 pounds of creosote. Later when an order is received on which the poles will apply, they are framed, *and then retreated.* If the customer's order is for an 8-pound treatment, 4 more pounds of creosote per cubic foot are injected into the pole, the Rueping process again being used.

Pretreatment prevents framing after treatment; it removes any incentive to hold untreated poles on the seasoning yard until decay begins in them; it is an economy to both the utility company and the creosoter.

Increasing Labor Costs in Relation to Pole Line Service

As a final recommendation, we urge that you recognize the steadily increasing costs of timber and of labor. There is sometimes a tendency to look askance at the purchase of high-grade poles whose

Both strength and beauty are noted in the poles on this street

life is known to average thirty[7] or thirty-five[8] years, when the line may not be used for that long a period. Yet the untreated pole, or the under-treated pole, purchased for an expected life of the shorter period, begins to require replacements early, on the basis of normal proved mathematical averages. The higher timber and labor costs that are indicated for a few years hence may more than offset the larger initial investment in poles of long life.

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[4]"Why Is There a Termite Problem in California." By Charles A. Kofoid, University of California, Berkeley, Calif.

[5]"Tests of Methods of Protecting Wood Against Termites or White Ants." U. S. Department of Agriculture Bulletin 1231 by Thomas E. Snyder.

[6]"Wood Poles." Report of Overhead Systems Committee, National Electric Light Association, 1926-27.

[7]"Wood Preserving News." September, 1925. Page 130.

[8]Report of Overhead Systems Committee, Pennsylvania Electric Association, 1923. Page 5.

Associated Releases Annual Report

Consolidated gross earnings of Associated Telephone Utilities Company for the twelve months ended March 31 were $15,281,921, as compared with $12,544,779 for the year ending December 31, 1929, an increase of 21.81 per cent. Consolidated net income before depreciation for the twelve months ended March 31 was $2,748,626, compared with $2,291,573 for the year ended December 31, 1929.

For the first quarter of 1930 consolidated gross earnings were $3,711,713, against $1,398,537 for the first quarter of 1929. Consolidated net income before depreciation was $671,196 for the first quarter of 1930, compared with $302,614 for the first quarter of 1929.

The number of stations operated by the company increased 18 per cent during the first three months of 1930. A total of 446,194 stations are now operated by the system, as compared with 378,164 on December 31, 1929. Since December 31, 1929, the company has acquired control of several well established operating telephone companies, including the Mutual Telephone Company, serving the city of Erie, Pa., and operating 27,873 stations in and adjacent to that city; Petroleum Telephone Company, Oil City, Pa., operating 12,094 stations; Johnstown Telephone Company, with 14,847 stations, serving the city of Johnstown, Pa., and the Ohio Cities Telephone Company, operating 6,052 stations in and near New Philadelphia, Ohio.

Submarine Tunnel of Cast Iron

New York Telephone Company to Install Largest Cast Iron Pipe Yet Constructed—To Be Seven Feet in Diameter and Weighing 1,700 Pounds to the Foot—Accommodate 148 Clay Ducts

The largest cast iron pipe ever manufactured will be used in the construction of a submarine telephone tunnel to be built under the Harlem River between Second Avenue and East 129th Street, Manhattan, and Lincoln Avenue in The Bronx, beginning early this summer. This subway, which will be perhaps the largest for its purpose in this country, is one of the chief engineering projects involved in the New York Telephone Company's provision of larger facilities for the increasing use of toll and long distance service between Greater New York and New England and Canada.

Approximately 614 feet of this huge pipe, weighing about 1,700 pounds to the foot, will be used. Under the river it will be seven feet in diameter, widening to nine feet at either end where it will terminate in manholes sunk 16 feet below street level. The iron tube will be encased in concrete and the whole supported 27 feet below the mean low water level at this point by piles driven into the bed of the river.

The subway when completed will contain 148 clay ducts, enough to carry some 150,000 telephone circuits, or about 300,000 separate copper wires. The circuits to be housed in these ducts will carry some of the heaviest long distance traffic in the world, telephone engineers point out, as calls between thousands of points westward, which pass through the company's long distance central offices in New York, as well as calls for points in New England and Canada originating in New York City, will be handled over this cable route.

Two methods of construction will be used in laying the large pipe. Excavation for the dry-land pieces will be made by driving cofferdams from the sites of the manholes almost to the bulkhead lines on both sides of the river, while the foundation for the underriver part will be prepared by dredging the bottom of the stream.

The large ends of the pipe, which weigh about 24,000 pounds each, will be swung into "cradles" made by piles driven into the ground at the bottom of the excavations, the ends of which will be left protruding to form the skeleton of the concrete form. After the concrete has been poured and allowed to harden the ends of the cofferdams will be removed, and the laying of the underriver span will be started.

A "cradle" similar to that used in the land construction will be built in the trench dredged in the river bottom. The pipe will be lowered into this cradle in 60-foot sections. These 107,000 pound sections, composed of smaller pieces of pipe already fastened together and calked, will be towed into position on a barge and placed by floating derricks. Divers will then fit the ends of the sections to pipes already in place, and after the entire crossing is finished, concrete will be poured under the water to form a coating two feet thick on the top of the pipe and a foot and a half on the sides.

The tunnel will then be pumped dry and the whole structure allowed to settle several weeks before the clay conduits are placed. The company's plans call for the pulling of the first cable through the tunnel in January, 1931. As many of the present submarine cables under the river are entirely adequate, there will be no general rerouting of cables through the tunnel at this time. Instead, the passage will be used to contain new cables. Protected by this triple coat of concrete, iron and clay, these cables will be safe from the hazards of both water and weather.

June 11, 1930.

New Utility Grouping

Municipal Telephone & Utilities Co. has acquired Associated Utilities, Inc.; Arkansas Electric & Water Co.; Central Telephone Co. of Oklahoma; North Central Telephone Co. of Missouri; North Side Telephone Co. of Missouri, and an independent telephone operating company in Kansas. The companies furnish electric light and power, telephone, water, gas and other utility service to more than 75 towns and cities.

Head of Clayton, Ind., Telephone Plant Dies

W. E. Pembleton, owner and operator of the Hendricks County Telephone Company, died suddenly in his rooms at Clayton, Ind., Friday, June 5. Pembleton came to Clayton last fall and bought the Clayton telephone system which has exchanges there, at Hazelwood and Stilesville. At the time of his death he was reorganizing it under the name of Hendricks County Telephone Company. He formerly had charge of a telephone plant at Prairie, DuSac and Sawk, Wis. Prior to entering the telephone business Pembleton had practiced medicine in Wisconsin. He is survived by his widow, Mrs. Anna Pembleton, now at Princeton, N. J., and a son, W. E. Pembleton, Jr., of Madison, Wis.

Setting High Poles

In This Article Mr. Ray Blain Describes the Method He Uses When Erecting Ninety Foot Poles

Sometime in the life of every telephone construction man, providing he follows this work long enough, he will be called upon to raise high poles for railroad, river crossings, etc. By high poles is meant those over 50 feet as poles up to that length can generally be raised in the usual manner with pike poles, a good jenny and a well trained crew. For long poles some special means is generally required which usually consists of a gin pole 50 to 60 feet high. The erection of the gin pole takes considerable time and is almost as difficult as raising the pole itself. I will attempt to describe a method used in the erection of some 90 foot treated pine poles without the use of a gin, which is, I believe, much quicker and easier especially if the pole is to be erected in a comparatively open space.

Poles of this length will be delivered on two cars usually the flat type and the unloading is a delicate operation as a little too much spring to a long pole is likely to break it. Care must also be taken not to drop them even a short distance or they may suffer the same fate.

Fig. 1—Rigging the pole for raising

Skids should always be provided and ropes tied to the car, wrapped twice around the pole and then snubbed off with a hitch around a standard so that the poles can be eased to the ground or onto a truck and trailer if the poles must be transported from the point of unloading to the place to be erected. In the case referred to here coal cars with drop ends were used which made the unloading somewhat more difficult.

After the pole has been delivered to the location where it is to be set it should be placed in a position from which it can be raised with the least difficulty. The hole should be dug large and trenched well from top to bottom. I am not in favor of setting high poles in the ground more than five feet. I contend that a pole higher than 50 or 60 feet should be well guyed four ways and when this is done it will hold the required strain when set five feet in the ground and a greater depth will not make it any stronger. In this case we poured about a foot of concrete in the bottom of the hole and let it harden before the pole was set, but it is doubtful as to whether this has any advantage. Personally I have never had much luck in setting a pole with concrete and in this case they were tamped in with dirt in the ordinary manner. A good heavy plank should be set on end in the hole for the butt of the pole to ride against as it slides into the hole. This plank should be smooth and wide enough so there is no possibility of the pole sliding off or binding in any manner as a drop might prove disastrous.

Fig. 2—The first jenny removed

The pole should next be rigged as indicated in Fig. 1 which consists of a jenny made up with two light twenty foot poles lashed or bolted together at the top. This is set over the big pole slightly past center toward the top and a block and tackle strung from it to a timber hitch around the pole. Two small rope guys are required to hold this jenny in place until the weight of the pole comes on it, after that it will be self aligning. A second jenny slightly larger than the first which can be made up of two 25 foot poles in the same manner as the first should be set up near the butt of the big pole and guyed in place. A snatch block should be lashed to the top of the large jenny and the hoisting line passed through it to give a lift pull on the pole. Three or four rope guys are now attached to the top of the pole and points selected where they can be hitched around something solid and pulled up or loosened as the pole is being raised to keep it in proper balance. If permanent guys are to be used on the pole time can be saved by attaching them to it on the ground as they will not bother in any way with the raising. The hoisting line used in this case was a 3/8 inch messenger attached to the large pole about two-thirds of the way from the bottom. This line was then attached to one end of a large block and tackle the other end of which terminated on a good anchor. A ton and half truck was used for the pulling. The pole was next lifted as high as possible with the blocks in the small jenny so that the load could be transferred to the hoisting line. It would of course be possible to lift the pole off the ground with the main hoisting line and the larger jenny but the arrangement described was used as it was thought that it would be quicker and safer.

When the load was taken over by the hoisting line the blocks on the small jenny were slackened which were then removed as shown in Fig. 2. Just before the small jenny was removed the two side rope guys were tightened to keep the pole directly in line with the pull. The raising of the pole from this point should be slow and easy and the foreman should direct the men on the rope guys to pull or slack off so that the pole is kept nearly in line with the hoist at all times.

The pole was raised slowly in this manner until it had reached the position as indicated in Fig. 3 when all strain was removed from the large jenny. The snatch block was then removed and the large jenny lowered out of the way. No fear should be had of stopping the pull at any point if the rope guys are well manned for the pole will stand firmly in any position.

From this point it is a simple matter to raise the pole slowly to a vertical position. Care should be taken to keep the back guy line, that is the one opposite the hoist fairly tight as the pole nears a vertical position. Due to the trenched hole the pole will slide slowly to the bottom without any drop with a sudden slackening of the guy lines which might cause the pole to whip in such a manner as to break it.

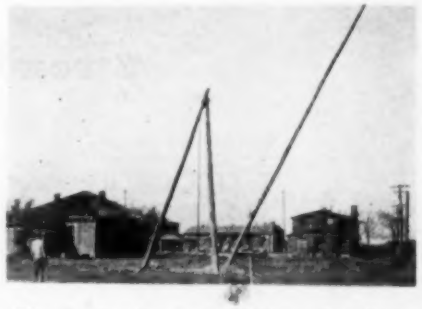
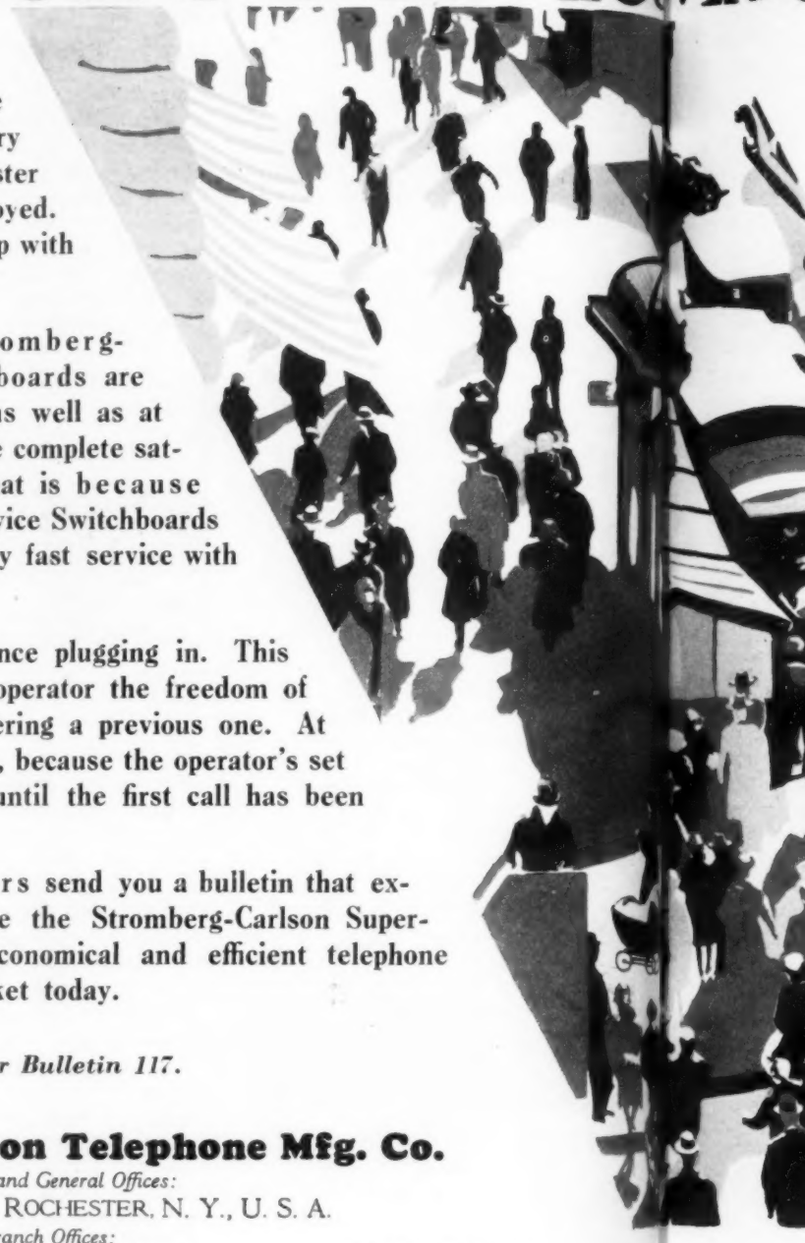


Fig. 3—Strain removed from last jenny

The pole in place, the permanent guys tightened and what is generally considered a difficult and dangerous undertaking was completed with ease.

Telephone Service who



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The Technique of Carrier Current Modulation

In the Following Articles Mr. F. J. Dommerque Discusses Carrier Current Modulation in a Very Instructive Way; You Will Find Information of Great Interest Herein

Properties of the Characteristic Curves of Vacuum Tubes

In addition to the information on vacuum tubes given at an earlier date (August, 1928) in the TELEPHONE ENGINEER several properties may be brought out which are of general information value and have also a particular bearing on modulation. The characteristic curve of a vacuum tube, that is, of the curve which gives the relation between plate current and grid voltage, also called the static characteristic, varies in form according to the construction of the tube, size and temperature of filament, and size and position of grid and plate; its composition, however, is generally the same: First a curved part, then a practically straight part more or less extended, then a curvature again, but bent in the opposite way from the first one. The inclination of the curves with respect to the horizontal (grid voltage) axis is different, they become steeper with increasing temperature of filament. This temperature, however, has a lower limit; if it falls below this limit the normal plate and grid voltages will cause saturation current to flow, the grid will then be unable to control the plate current and the tube will become inoperative.

We speak here of the tube characteristic which shows the relation of plate current to grid voltage. There are still other curves of the tube, wherein for instance the relation of the plate current to the filament is expressed, but they do not interest us here. What interests us most is to ascertain the effect the characteristic curve exerts upon the performance of the tube.

Graphs Illustrating the Vacuum Tube Action

In Fig. 1 the characteristic curve C shows a considerable stretch of straight line. There is inserted in the drawing perpendicular to the grid voltage axis a time axis upon which is laid out the sine curve which may be taken again as a representative of the more complex voice curve which actually furnishes the modulating voltage. This voltage is the input voltage. We now project the sine curve upon the straight part of the characteristic curve and draw two lines parallel to the voltage axis, which will give the crests of the output current wave, which has the same shape as the input voltage wave, and thus is symmetrical about its axis XY. This indicates that the relation between input voltage and output current is "uniform," as long as the characteristic curve remains straight; a non-uniform relation would mean distortion

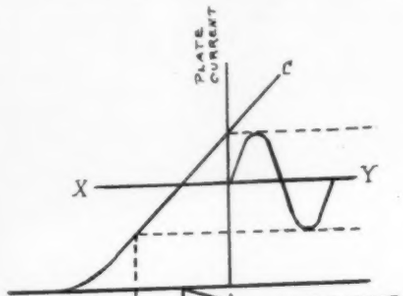


Fig. 1—Amplifier action of vacuum tube

of the received voice, which would be detrimental. Consequently, to obtain satisfactory transmission in cases where the vacuum tube is used as an amplifier it is essential that the characteristic curve is worked on the straight part, because then the amplification produced will not be distorted.

In Fig. 2 a characteristic curve C is plotted with a prominent curvature. On the time line are two sine curves plotted, each having a different amplitude. We project these curves again upon the characteristic curve, draw the lines parallel to the voltage curve and draw in the current curves between the parallel lines, obtaining two curves which show that the current does not remain uniform, because the line XY moves up with increase of input voltage, indicating that the average value of output current follows the amplitude of the input voltage. When a voltage of varying amplitude is impressed upon a vacuum tube, the current in the telephone will follow the variations of the amplitude of the corresponding output current. Thus this tube serves as a device, which may be designated as rectifier or detector.

Carrier Wave Modulation

So far we have not introduced the carrier current. In doing this we must keep in mind the difference which exists between superposition and modulation of two oscillations. In the process of modulation the melting together of the carrier current and voice frequency current waves can be effected by letting the two oscillations in superposition act upon a vacuum tube which has a characteristic curve with a pronounced curvature.

We now construct upon the time line in Fig. 3 the sine curve representing the voice frequency curve and superimpose upon it the carrier curve. In the circuit diagram accompanying the construction diagram the voice frequency voltage is obtained from the transmitter T and imparted to the modulator or rather to the grid circuit, by means of a transformer. The producer of the carrier current, designated in this diagram by O, may be an oscillator (vacuum tube) or a high frequency machine. It will be noticed that the secondaries of the two transformers are connected in series. The corrugated curve of the combined voltages, similar to the superposition curve shown in the February number of the TELEPHONE ENGINEER in Fig. 1, or rather the two voltages represented by it, are then simultaneously impressed upon the grid. By the construction followed in the Fig. 2 above, the variably corrugated curve of the output current is obtained. This modulated current is then carried to a transformer shown in the circuit diagram, the secondary of which is connected to an amplifier.

In the circuit diagram of Fig. 3 a battery E is inserted in the grid circuit for the purpose to insure that the grid will not become positive in respect to the filament. In reverting to Fig. 4—characteristic tube curve—on page 28 of the August, 1928, TELEPHONE ENGINEER it will be noticed that, when the grid voltage is positive, a slight grid current will flow, which, of course, will consume power in the grid circuit and detract from the signal strength. Therefore, in order to keep the grid voltage negative, even when the signal voltage reaches its maxi-

mum positive value, the small battery E is connected in the grid circuit so that the grid becomes negative in respect to the filament.

The Self-Oscillating Modulator

As the carrier telephone systems are bound to experience modifications as time progresses, and as these modifications will

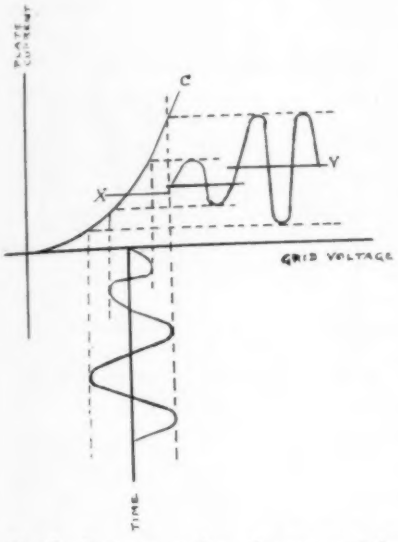


Fig. 2—Detector action of vacuum tube

have as their main incentive the desire for greater simplicity and consequently a higher degree of economy, it will be opportune to study the self-oscillating modulator as described by Black, Almquist and Ilgenfritz in the paper on "Carrier Telephone System for Short Toll Circuits" mentioned in our last article, where we briefly described the action of the generation of the carrier current.

In Fig. 4 that part of Fig. 3 in our last article is redrawn, which pertains particularly to the new features in modulation. We are already familiar with the principal actions of the modulator and demodulator, namely the suppression of one of the side bands in the modulator, the reproduction of the voice frequencies in the demodulator, the suppression of the undesired high frequency currents present in the output of the demodulator by the low-pass filter. What is left to explain are the new features introduced by the system as described by Black, Almquist and Ilgenfritz. As this system is a system with suppressed carrier, where the carrier is generated again at the receiving end, the design of modulator and demodulator is practically the same.

One of the new features in Fig. 4 is the elimination of the grid battery. The grid biasing voltage—in this case, 100 volts—is produced by rectifying in the grid circuit a portion of the sinusoidal carrier wave applied to the grids. The extent to which this rectification has to be or can be carried is regulated by adjusting the resistance R_g and the capacity C_g in the grid circuit, their values being so proportioned that the grid biasing obtained in this manner approaches closely the peak voltage of the applied carrier wave. R_g and C_g, or either of them, may be made sufficiently large by making the portion of the wave rectified as small as desired. The quantity of electricity stored by the condenser C_g remains substantially constant. In Fig. 5 is reproduced the characteristic of the vacuum tube of either one of the two. The large wave constructed upon the time line is the sinusoidal wave of carrier frequency as applied to the grids by the oscillator coil; this wave is expressed by the equation $-e'_g = 100 \sin 2\pi f_c t$, where f_c is the frequency of the carrier and e'_g the applied grid voltage. As this diagram is to serve only to illustrate the relation of the static characteristic of the tubes to the applied grid voltages, the voice wave is omitted; that is, there is no speech input. The equation of the grid voltage is $E_g = R_g \times I_g$.

The very small wave plotted along the time line is the charge and discharge curve of the condenser C_g, a charge and discharge interval comprising the one ten thousand three-hundredths part of a second. During the discharge interval t_d the total condenser charge is exponentially diminished by a relatively small amount, the extent of the reduction depending upon R_g and C_g. During the charging interval t_c the grid is positive with respect to the filament and the total

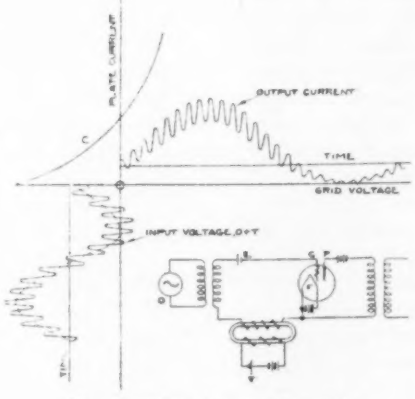


Fig. 3—Modulator schematic

quantity of electricity stored in the condenser C_g is slightly increased. The relatively small quantity of electricity, which may be expressed by the mathematical symbol ΔQ, discharged by the grid condenser and dissipated by the resistance during the discharge interval must equal the differential increment of quantity accuculated by the condenser during the charging interval.

The portion of the carrier wave being exceedingly small and the grid biasing voltage applied to each of the two oscillator tubes of Fig. 5 differing by an amount corresponding to the voltage drop across the filament of a single tube owing to the series connection of the filaments and the use of a common grid biasing circuit, account for the circumstance that, with no speech input, the grid of only one tube (T_1) is driven positive.

As the grid biasing voltage for the modulator is —100 volts, while it would

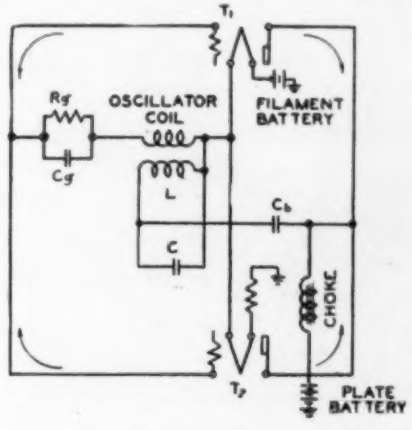


Fig. 4—Oscillator circuit of the self-oscillating modulator

be only —18 volts if this type of tube is operated as an ordinary plate circuit modulator, only a portion of the carrier and voice voltages applied to the grids is effective in varying the plate current.

Demodulation

Modulation and demodulation being similar in operation, use practically the same apparatus and the same circuit to accomplish their purpose. As stated before, the modulated carrier wave presents for every component frequency of the modulated voice wave two components, one of which is greater in frequency than the carrier wave by the frequency of the voice component, and the other one of which is less by the same amount; we have expressed this by the too high frequency oscillations ω_1 and $\omega_1+\omega_2$ or ω_1 and $\omega_1-\omega_2$; furthermore, the modulated wave contains a number of harmonics and combinations of oscillations, the latter due to the curved forms of the tube characteristic; this class may be expressed by the form $p\omega_1+g\omega_2$ and $p\omega_1-g\omega_2$, wherein p and g may be any integer number. The carrier frequency ω_1 remains constant for all oscillation components of the voice, while ω_2 is the oscillation of one of the component oscillations of the voice, the complete voice being composed of a number of frequencies, say, Φ_1, Φ_2, Φ_3 ...., which appear after modulation as $\omega_1+\Phi_1$, $\omega_1+\Phi_2$, $\omega_1+\Phi_3$ ....

The demodulator reproduces from the carrier and side band, one of which only is transmitted as we learned before, all the components of the voice wave with their proper amplitudes, the amplitudes of the side band being proportional to those of the original voice components, the amplitude of the carrier remaining the same for all of them. The original speech wave is obtained by subtracting

the carrier frequency from any component of the side band, which was produced by the corresponding original speech wave component.

In the output circuit of the demodulator occur high frequency oscillations in-

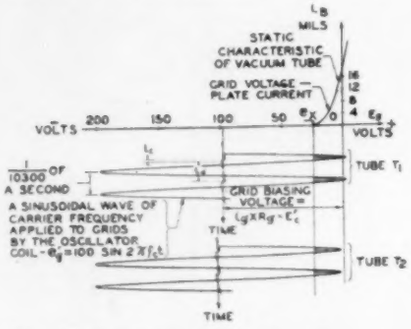


Fig. 5—Relation of the tube characteristic to the grid voltages of the oscillator. No speech input

audible in the telephone. Then there are the voice frequency oscillations and the harmonics. There is also a possibility of oscillations leaking from other high frequency channels or radio sending stations coming in over the lines and becoming mixed with the carrier oscillations. All high frequency oscillations and higher harmonics are blocked by a filter inserted behind the demodulator, which will pass the voice frequency oscillations only.

The Magnetic Modulator

In the system of magnetic modulation the high frequency energy is modulated by means of superimposed direct current magnetization of an inductance coil.

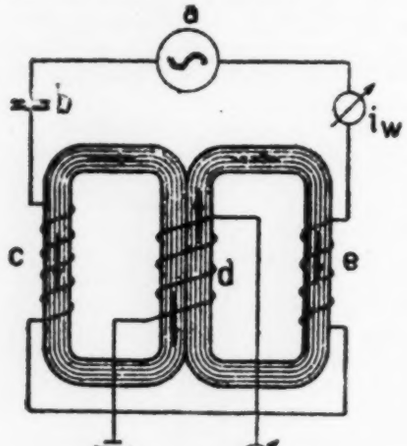


Fig. 6—Fundamental circuit of magnetic modulator

The modulation is effected by the change in the inductance of the coil and thereby of the resonance conditions, and by the change of the effective resistance due to the iron losses. If the coil is properly dimensioned a wide range can be procured for the inductance and resistance to vary over.

In Fig. 12 of the preceding article the magnetic modulator TD was shown with a ring-shaped core for sake of simplicity; in actual practice, however, the core is given a different form. We will first present the fundamental construction and circuit of the coil. The coil shown in Fig. 6 has two completely separate cores made up by winding very thin iron band

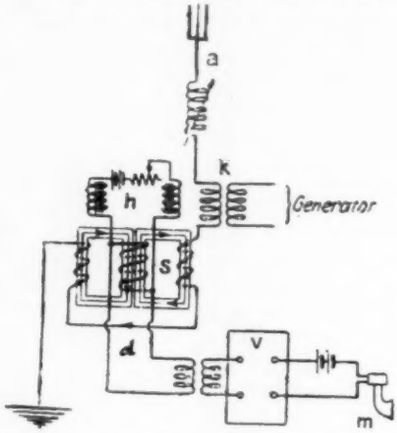


Fig. 7—Gerth-Schmidt system of magnetic modulation

with paper in between into a rectangle for each core. This construction will cause each core to have its own path for the flux of lines of force. The high frequency winding "c" and "e" connect to the high frequency machine "a"; they are wound around the outer legs of the double core, while the winding "d" for the modulation current connected to the source of direct current which is regulated by a variable resistance and a meter "iz," is laid around the two inner legs. The high frequency circuit also contains the condenser "b" and the meter "iw" for measuring the current.

The two parts of the high frequency windings are laid on in such a manner that their fluxes run in opposite direction inside the winding "d," as indicated by arrows in Fig. 6. Consequently the resulting flux of the fundamental frequency, that is, the sum of the two fluxes in the two parts of the high frequency winding, equals zero, while the flux caused by the modulation current permeates both high frequency windings.

An application of a magnetic modulator in a radio sending station in Germany is shown in Fig. 7. This represents the Gerth-Schmidt system of magnetic modulation. The high frequency generator is connected to the antenna circuit by the coupling K. The high frequency windings are connected to the ground of the antenna circuit and are laid around the outer legs of the magnetic modulator coil S. The talking currents produced by the transmitter "m" are amplified in the amplifier "V" and pass by inductive coupling into the modulation winding "d," which is laid around the inner legs of the modulator coil. Bridged across the modulation circuit is the battery with its variable resistance. This battery circuit is provided also with re-

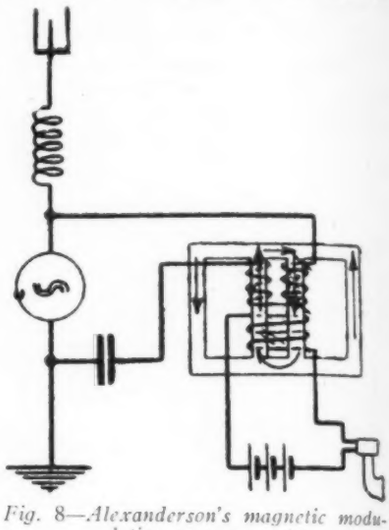


Fig. 8—Alexanderson's magnetic modulation arrangement

tardation coils to keep the talking current out of the battery circuit "h." The battery serves to magnetize the iron core of the modulator coil as described above.

As an example of the application of a magnetic modulator in America the Alexanderson arrangement as used in the New Brunswick station is reproduced schematically in Fig. 8. It will be noticed that the Alexanderson coil has a one-piece core with two inner legs, which are wound with the high frequency winding and also with the modulation winding. The coil is connected in parallel to the high frequency machine. In this arrangement the resulting flux of the lines of force is also equal to zero and the superimposed battery effects the magnetization of the core.

Texas Association Elects New President and Secretary

L. S. Gardner of Waco, for the last eleven years secretary of the Texas Independent Telephone Association, was elected president at a called meeting of the board of directors Friday in the Adolphus Hotel. Mr. Gardner is vice-president of both the Texas Home Telephone Company and the Texas Telephone Company.

R. B. Still of Tyler, who has been president for the last eleven years, is leaving the State to go with the Gary interests at Kansas City.

Oscar Burton of Tyler, with the Gulf States Telephone Company, and C. E. Hoy of San Antonio, with the Texas Associated Telephone Company, were elected directors. Mr. Burton was elected secretary-treasurer.

District meetings will be held at Austin, Corpus Christi, Tyler, Waco and Abilene, on dates to be announced.

Telephone Storage Batteries

Ray Blain Tells How the Storage Battery, Once Considered a Thing of Mystery, Has Been Perfected And Is Now an Ordinary Piece of Equipment

The storage battery always has and perhaps always will be the most important part of our efficient telephone systems. In fact, it is the storage battery which makes possible our modern exchanges, for without their constant supply of noiseless, pure, direct current always available efficient telephone service could not be maintained.

Until recently storage batteries were a thing of mystery by the average individual and their maintenance a continual worry. Within the last few years storage batteries have entered the lives of millions via the automobile, radio, etc. While perhaps their principles are not always understood they have reached that stage of electrical and mechanical perfection which makes their operation so simple and the results so certain that they are now used and maintained without trouble or worry on almost any application. They go with aeroplanes to lofty heights; with submarines to the bottom of the sea; furnish comforts to explorers in arctic wastes and, in fact, perform duties untold besides that all important one of energizing our modern telephone system.

Storage Battery History.

The discovery of Volta in 1800 started research in the electrochemical field which was the forerunner of the perfect storage battery of today. Gautherot advanced somewhat with his experiments which were repeated and carried on by Ritter in 1803. Plants in 1859 constructed a simple battery for the storage of electrical energy which consisted of two plates of lead separated by a sheet of rubber and rolled together. This may well be considered the birth of the storage cell.

Telephone Storage Batteries.

The requirements of a telephone storage battery are perhaps more exacting than any other of the entire electrical field. The battery is the heart of every modern telephone system, for should it fail every telephone in the entire exchange would immediately cease to function. These rigid requirements have been met by the storage battery manufacturers to the entire satisfaction of all. Just a few years back it was standard practice in many exchanges to provide two batteries, one in use and one spare, while today duplicate sets are never considered proving the faith of telephone men in the modern battery.

The telephone storage battery must always be of sufficient size to provide adequate capacity to carry the system over a failure of the commercial power supply. With the present reliability of this power supply the reserve battery capacity need not be as great as formerly, for rare, indeed, would be the case where this supply to a telephone exchange would fail over a period longer than a few hours.

Telephone exchanges are generally equipped with one main battery of 11 cells, usually referred to as the 24-volt battery. A second set of 11 cells are provided which are connected with the main battery and the whole referred to as the 48-volt battery. The 48-volt battery provides current for the toll board and in many cases is used to float the PBX batteries over a number of cable pairs.

Cell Construction.

Pasted plates are one of the types commonly used in telephone work. They are constructed of a grid arrangement which act as supports for the active material. The grids usually have crossbars and are designed so as to best lock the active material in place.

Here is a modern battery for the small exchange, farm lighting, etc.

The Plante plate also commonly used in telephone work differs from the paste plate in that their active materials are obtained by oxidizing the surface and not from paste applied mechanically.

Some type of thin porous separators must be placed between the alternate positive and negative plates of the cell to act as an insulator. The most common types of separators are constructed of wood or hard rubber. Wood before being used for separators is treated chemically to remove all matter which might prove harmful in the cell.

The containers commonly used for portable batteries are hard rubber. Formerly these were protected with a wood covering, but lately a rubber case is generally used. Glass jars are commonly used for all stationary batteries, including the telephone types except the larger ones which are equipped with lead lined tanks.

Sealed glass jars have been in use for years in small batteries and have been so successful that their use has recently been extended to include cells up to a size that can be handled safely as a complete unit. As one manufacturer of tooth paste used to advertise "We couldn't improve the paste so we improve the tube." Likewise the manufacturers of batteries couldn't improve the elements so they improved the containers and methods of assembly. However, the advantages of the sealed jar over the open type are many. First of all, while a closed cabinet or battery room is not entirely necessary for the installation of the sealed type cells, but if they are to replace the old type the same space can be utilized for their installation. The spray loss is eliminated in the sealed type as well as the creeping down the sides of the cell, which reduces the leak between cells and makes a clean, dry battery room a possibility. The evaporation is less, making the addition of water less frequent. Then there is that all important advantage which keeps meddlesome persons from tinkering with cells such as shifting separators and removing imaginary shorts from between the plates which in many cases has caused serious damage to batteries. With sealed types the weight of plates are supported evenly all around the top of the jar, making a much stronger mechanical arrangement than possible with the

(*Continued on page* 42.)

Unique Cable Transferring Job

Illinois Bell Telephone Company Meets Situation and Overcomes Complications in Manner Shown in Illustrations on Opposite Page

During the late spring of 1930 the Illinois Highway Department notified the Suburban Division Plant department of the Illinois Bell Telephone Company that plans had been changed on the proposed pavement of one of the highways leading out of Chicago and instead of a twenty-foot strip, a forty-foot concrete pavement was to be laid, and that the poles along this highway would have to be moved to allow the widening of this highway.

This change of plans with respect to the pavement required the moving of the pole line supporting the toll cables north about twenty-one feet to the new property line, and permitted a very limited period in which the move was to be made. About one and one-half miles of poles (sixty-seven) carrying three cables for one mile and two cables for one-half mile were involved in this move. A very ingenious method was developed to do this work.

A new line of poles was set at the proposed location, after which the digging machine excavated a hole to the north of the old line of poles, which were then pulled over so that the cables could be transferred from the old poles to the new poles with a minimum amount of labor and hazard to the cables. The transfer was made by means of the winch line of a truck, while the winch line from a caterpillar tractor earth borer was used as a temporary side guy.

A great deal of time was saved by this method which naturally reduced the cost very materially; service was uninterrupted during the period.

The work was handled in a rush to keep ahead of the contractor and no accidents occurred to employes or the public.

Pictures showing how this job was carried out appear on the opposite page.

Important Changes in Illinois Bell Telephone Company

Chicago.—Changes in the executive organization of the Illinois Bell Telephone Company were announced June 25 following the monthly meeting of directors.

W. R. Abbott, president, was elected chairman of the board of directors, succeeding B. E. Sunny, who retires from the service but continues as a director. F. O. Hale, vice-president in charge of operation, was elected president and continues as a director, and A. H. Mellinger, general manager, Chicago Area, was elected vice-president, succeeding Mr. Hale. U. F. Cleveland, general auditor, was elected vice-president in charge of finance and accounts to succeed B. S. Garvey, who retires. W. O. Kurtz was appointed general manager, Chicago Area, succeeding Mr. Mellinger. P. J. Ramsey, general plant manager, Chicago Area, was appointed general manager, State Area, succeeding Mr. Kurtz. Arthur Perrow was elected general auditor, succeeding Mr. Cleveland, and A. D. Grote was named chief accountant, succeeding Mr. Perrow.

Mr. Hale, the new president of the company, is a native of Vermont and a graduate of Dartmouth College. His entire business career has been spent in the telephone service. He came to Chicago in 1921 from St. Louis to become chief engineer of the Illinois Bell. He was elected vice-president in 1922. Mr. Hale is a vice-president of the Union League Club, a member of the Industrial Club, Commonwealth Club, University Club, Chicago Golf Club and the La-Grange Country Club. He is a director

F. L. Hale, President, Illinois Bell Telephone Co.

of the Harris Trust and Savings Bank, the Madison-Kedzie Trust and Savings Bank, and the Terminal National Bank. His home is in LaGrange.

Mr. Sunny's retirement completes an active career in the telephone business extending back to 1879, only one year after the telephone was introduced into Chicago. He was superintendent of the first telephone exchange. Leaving the service in 1888, to become western manager and subsequently vice-president of the General Electric Company, he returned to it in 1908 as president of the Chicago Telephone Company, now the Illinois Bell. He was made chairman of the board in 1922. Mr. Sunny is also chairman of the board of the Chicago Great Western Railroad, a director and member of the executive committee of the Chicago City Railway Company, a director and member of the executive committee of the First National Bank of Chicago, a director of the Middle West Utilities Company, a director and member of the executive committee of the General Electric Company, and a director in several other companies.

Mr. Abbott, the new chairman of the board, has been president of the company since 1922. His connection with the telephone business covers forty-one years, thirty-seven of which have been spent in Chicago. Mr. Abbott is a director of the First National Bank of Chicago and the Chicago and North Western Railroad. He is vice-president of the Chamber of Commerce of the United States and president of the board of trustees of the Museum of Science and Industry founded by Julius Rosenwald.

Mr. Mellinger, the new vice-president in charge of operation, is a graduate of Ohio State University, and has also spent his entire business life in the telephone service. He came to Chicago in 1928 from New York to become general manager of the Chicago Area of the Illinois Bell.

Mr. Cleveland, who becomes vice-president, is a veteran in the Illinois Bell organization. He started as a payroll clerk for the Chicago Telephone Company in 1892. He has been general auditor of the Illinois Bell for the past ten years.

Illinois Telephone Association to Meet in Peoria

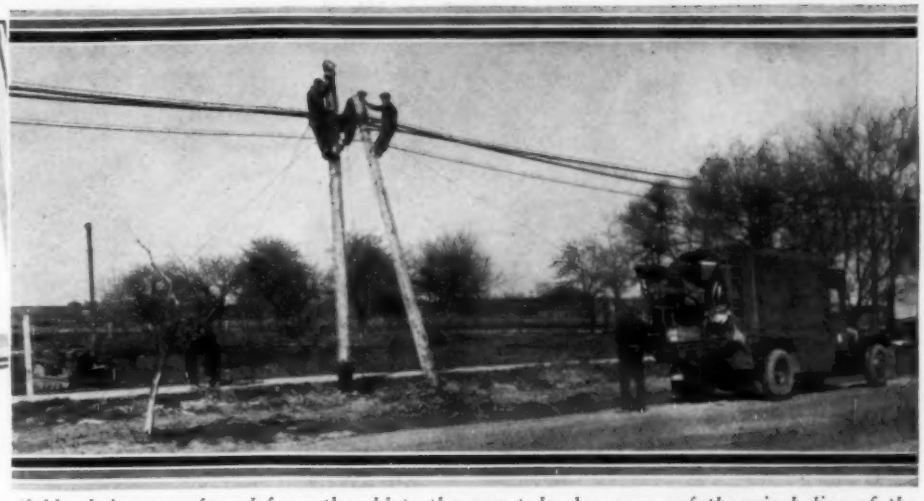
Peoria, Ill.—The twenty-sixth annual convention of the Illinois Telephone association will be held here November 12 and 13. The convention is expected to be attended by several hundred managers, superintendents, and chief operators. Exhibits will be presented in the Hotel Pere Marquette.

Free Telephone Service Offered by Store

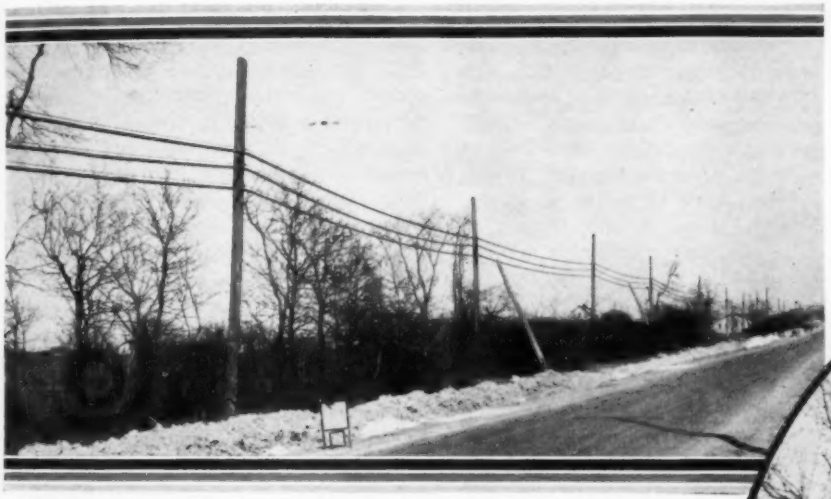
A unique telephone service feature has been added to the department store of M. Epstein in Morristown, N. Y. Customers or would-be customers who live in the surrounding territory can call a special telephone number and the call will be put through to the Epstein store without expense to the caller.

AN UNUSUAL CABLE TRANSFERRING JOB IN SUBURBAN PLANT OF ILLINOIS BELL TELEPHONE CO., IN CHICAGO

Story on Opposite Page

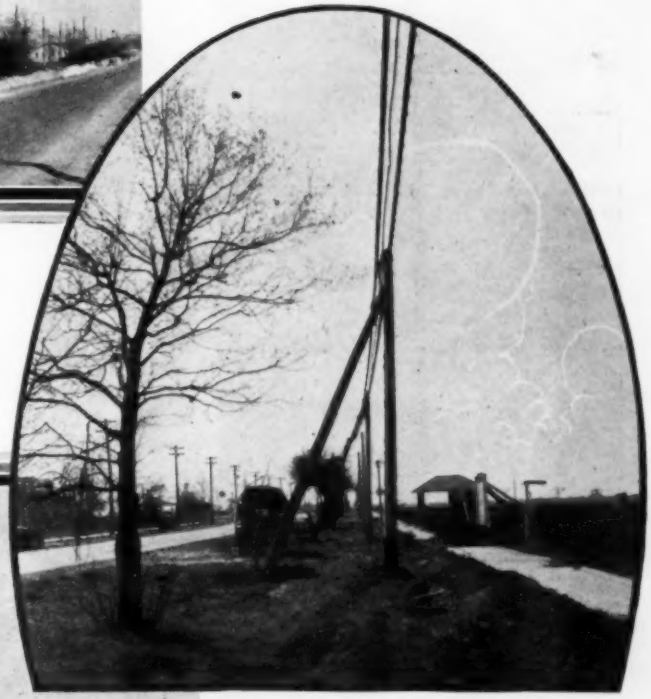


Cables being transferred from the old to the new poles by means of the winch line of the truck in the foreground. The winch line from the caterpillar tractor earth borer, at the extreme left, is being used as a temporary side guy.



This picture shows the three cables on the new poles, all on the road side, which location made the transferring less hazardous and future work of dismantling less costly. The poles were raked slightly away from the cable to distribute the load.

Below: A view of the pole line while splicing was going on. This work was necessary to cut in the new lateral cables from the manhole to the newly located lateral poles.



Above: How the cable transferring job was carried out. The pavement at the left was to be widened, necessitating the moving of our pole line. The new line of poles is shown at the right. After these poles were set, a digging machine excavated a hole to the north of each of the old poles, which were then pulled over so that the cables could be transferred to the new poles with minimum labor and hazard to the cables.

—Courtesy Bell Telephone News

LINE AND DESK

TELEPHONE LOOKIEGRAPH.

In these modern times pole setting with a properly equipped power truck is a simple and easy operation. However, the small companies do not always have enough pole setting to do which will justify the cost of such equipment so poles must be set by the old man power method.

Here is an innovation in the reproduction of photographs, showing a dozen scenes on one cut. The photos were sent in by Ray Blain, who describes his apparatus as a "Lookiegraph." In this small space is shown the telephone pole from the time it was unloaded on the roadside to the time it was placed for permanent use. While the views are small, each one is distinct and shows each movement in the erection of the pole by the crew. In the letter accompanying the photo Mr. Blain states that he believes more illustrations should be used, and suggested this as one method of holding the cost down. If you like the idea, write us, as Mr. Blain is anxious to know whether these are preferable to one or two larger illustrations.

While considerable hard labor is required to set poles by the old method, yet with the necessary tools and each member of the crew well trained to handle their particular job, poles can be set quickly and with the least possible effort as the accompanying lookiegraph will indicate.

Poles are seldom dropped from the truck in a position from which they can be raised to a perpendicular position. To move the butt of the pole in position over the hole two good "Lug Hooks" should be provided. A digging bar is next placed in the hole for the butt of the pole to slide down on as the men raise the pole in place on the Jenny. A minute to rest then another lift and the jenny is moved on toward the butt of the pole and the top higher in the air. In this position pike poles can be used and two are placed over the top to do the lifting and two on the sides to prevent trouble. Now one good lift and while the jenny holds the load, the pike poles are lowered one at a time until they are in position to kick the pole into the hole on the next lift. At this point ground the poles in four different directions so that the pole will be held firmly in position for tamping. Now the more tamps the better, with the laziest man on the shovel taking his time and the pole will be set so that it will stay that way. This completes the job and we are ready to move on to the next pole where the process is repeated until the finish of the line or the close of a perfect day.—Contributed by Ray Blain.

ANOTHER DIFFICULT FEAT.

At high tide June 30th the last section of the New York Telephone Company's telephone subway under the Hutchinson river just north of the Boston Post road drawbridge in the Bronx was laid in place, completing the under-river work on this important project which has been under construction for several months.

The 60-foot section of the pipe, which is four feet in diameter, was placed in a trench dredged in the bottom of the stream and fitted to pipe already placed, by divers using pneumatic tools. This long section was composed of five 12-foot sections which were placed on a barge, calked together, bound to steel "I" beams, and towed into position. Two floating derricks were used to lift the pipe from the barge and place it on the bottom of the river.

The new subway, with its 497 feet of iron pipe connecting, through manholes on either side of the river, with existing cable subway, will be used to carry telephone cables from New York City to communities along the north shore of Long Island Sound, as well as to inland points in New England, and to Canadian cities. Clay conduits, sufficient to accommodate 46 cables, will be placed inside the pipe as soon as it is pumped dry and allowed to settle. This number of ducts is sufficient to take care of the anticipated growth in circuits along this important toll route for several years.

At present, the crossing of the river at this point is effected by eight submarine cables. These will be replaced by the new subway which will afford even greater protection for these important circuits against the hazards of both water and weather.—Contributed.

SHORT CUTS IN DRAFTING.

Circuit and equipment drawings, giving all information for manufacture, installation, and maintenance, are essential elements in the production of telephone plant. Their cost is far from negligible, sometimes running to several hundred dollars per tracing. In studies leading to cost reduction, therefore, which comprise an important part of the Laboratories' work, they cannot be overlooked. For this purpose the production of drawings may be regarded much the same as the production of any other part that goes into the plant. Each step in their manufacture should be studied and advantage must be taken of new procedures, materials, or equipment which will reduce their overall cost.

One of the characteristic traits of cost reductions is the importance of small savings.

A recent development strikes perhaps even more directly at the cost of making drawings. Usual procedure makes an initial pencil sketch on paper which is then traced to furnish the master copy for the production of blueprints. It is obvious that a considerable saving would result if the tracing step could be omitted, if blueprints could be made directly from

the pencil drawings. This has offered many difficulties, however. Efforts have been made to find some grade of tracing paper which would permit the use of a pencil and yet make suitable prints, and some success has been obtained. If the paper is satisfactory for the use of hard pencils, however, it is generally too dense to make satisfactory prints, or vandykes, while if soft pencils are used, the drawings are apt to smear, particularly if extensive changes are required. Then, too, the life of a paper drawing is very short when used in a blueprint machine, and the ease with which they are torn further shortens their period of usefulness.

Regular tracing cloth has been unsatisfactory for this purpose because it will not take lead, but recently a new cloth has become available which seems to solve the problem. It has a finely woven mesh with a dull finish on one side and on the other a glossy finish designed for pencil. A fairly hard pencil, either F or 2H, may be used, depending on the touch of the draftsman. Since the drawing is made on the glossy side, dirt is not readily picked up and the drawing will not smear while being worked on. The life and freedom from tearing is about the same as for the ordinary tracing cloth.

Such pencil drawings may be used as masters for making vandykes or reproduced tracings, which yield the equivalent of a regular tracing from a pencil drawing without the extensive and costly labor of tracing. Whether the pencil drawing will be used to make reproduced tracings or serve as a master itself, depends chiefly on the life that is expected of the drawings and the extent of the changes that may be required. In either case the blueprints resulting are indistinguishable from those obtained by the more usual procedure.

The new method is a distinct step forward in the reduction of drafting costs. It is estimated that nearly one-half of the draftsman's time is saved since all the layout work usually done with pencil may be done on the original drawing.—W. L. Heard in Bell Laboratory Record.

Two-Way Television Shown First Time

One more step in man's conquest of space and time, making it possible for two persons separated by distance to talk to and see each other as though they were in the same room, through the development of a two-way television-telephone system, was demonstrated for the first time to newspaper men by the American Telephone and Telegraph Company.

The demonstration was the fourth step in the development of television by the A. T. & T. The first was by wire and the radio in April, 1927. The second was the outdoor television in 1928, while the third was the color television in June, 1929. All the previous steps were one-way television, only one end of the circuit being visible. The latest development permits both parties to the conversation to see and hear each other.

Each newspaper sent two representatives, one to the auditorium of the telephone company's building at No. 195 Broadway and another to the Bell Telephone Laboratories at No. 55 Bethune Street, about two miles away. In turn the representatives of each newspaper were given the opportunity to interview each other "televisionally."

At a given signal one was told to enter the special mysterious chamber, lighted with a dim orange light. One seats one's self in a swivel chair and swings around to the right to face the strange apparatus. The first thing one sees is a blue spot of light. Below that, through an inclined plate glass, there is a small frame upon which one sees a new mystic-sounding word, "Ikonophone." Below that is the legend "Watch this space for television image."

Suddenly the sign is lifted and in its place one sees a familiar face. One suddenly gets the uncanny sensation of looking into a magic mirror. Hello, hello! There is no telephone of the familiar type in the room, but the voices come just the same. One gets the impression of conversing with an animated moving picture. And wierdly enough the animated moving picture talks back.

The face of each person is rapidly scanned by a mild beam of blue light which reflects from his face to a group of photo-electric cells and gives rise to the current which transmits his image to the other person in the distant booth. There is no fierce glare to the scanning beam; one is not annoyed by its presence and may even gaze directly at it without inconvenience.

The ordinary telephone is not used because it would hide part of the speaker's face from his distant observer. A novel arrangement of a concealed transmitter and receiver avoids this difficulty and enables the speakers to talk to each other as though they were in the same room. And while the distance actually was only two miles, it was explained that the same results would be obtained thousands of miles away.

Walter S. Gifford, President of the A. T. & T., and Dr. Frank B. Jewett, Vice President of the company and President of the Bell Laboratories, both declared this was but another step in the policy of the company fully "to expire and develop every field which gives promise of possible improvement in and extension of electrical communiciation." Both also made it clear that the commercial possibilities are still uncertain.

The work is a result of continued efforts by the same group responsible for the earlier achievements in this field. It is headed by Dr. Herbert E. Ives of the Bell Laboratories Research Department, with most important contributions by Dr. Frank Gray and H. M. Stoller, who developed the synchronizing mechanisms, and by A. W. Horton and M. W. Baldwin, who were in charge of the work on the amplifiers.

Plans Underway for Transocean Cable Terminal

The long-heralded transatlantic submarine telephone cable will soon be an actuality as present plans call for its construction in the near future together with connecting land line systems in North America. The American Telephone & Telegraph Company will expend between $10,000,000 and $15,000,000, including accessory equipment, on this installation which will augment the existing radio-telephone channels when opened to service in 1932.

Buildings will be erected on Cape Breton, Nova Scotia, and at several points in Newfoundland, to house the electrical equipment required to operate the sub-ocean telephone cable. From Cape Breton the cable will cross to Newfoundland and thence to Ireland where connection will be made with the telephone network of the British Isles and the European continent.

The engineering and development work on the proposed cable has been undertaken by the Bell Telephone Laboratories. This organization has also been active in the commercial development of modern high speed submarine telegraph cable. As the Western Electric Company has no facilities for the construction of a cable of the length required, the actual manufacturing will probably be done in Europe.

The existing transatlantic telegraph cables will not transmit frequencies sufficiently high to permit telephone communication over them. This situation has been met in the design of the proposed cable, largely by the employment of new loading and insulating materials, recently developed by the Bell Laboratories.

An open wire line will be built to connect the cable with Bell System facilities in the United States. It will cross from Maine into New Brunswick north of St. Stephen. Proceeding via St. John, Amherst and New Glasgow to Sydney Mines, Nova Scotia, the line will connect with a submarine cable to Newfoundland. Here connection will be made with the main transatlantic cable to Europe.

Rural Line Development

Delivered by R. J. Benzel, Oklahoma City, General Manager Southwestern Bell Telephone Co., Before the Telephone Division, Twelfth Annual Convention, Oklahoma Utilities Association at Tulsa, Okla., March 12, 1930

In Oklahoma over one million people, about 45 per cent of the state's population, live on farms. This farming population is the most important element of our state and receives the poorest telephone service. Not only are the telephones relatively infrequent, there being only 68,000 farm telephones in the state, but satisfactory service is certainly the exception rather than the rule.

This condition does not seem to be peculiar to Oklahoma, but rather quite general over the entire country. The question of rural telephone service has been a subject for considerable discussion in all conventions of telephone people held in the last year, and it seems that the telephone companies are beginning to realize their responsibility to the farmer and are taking constructive steps toward furnishing him with better telephone service.

It would seem that the farmer, due to his relative distance from cities and towns, is considerably more in need of good telephone service than the average urban resident, and it is interesting that in Oklahoma there are less than 7 telephones per hundred farm population, while there are 20 city telephones for every hundred of city population.

That the telephone is necessary in progressive farming is evident from the increased use of the service on the part of the farmers who have been furnished satisfactory telephone service. Such farmers keep constantly in touch with the markets for their products, and in this way alone have made the telephone more than pay for itself.

The greater part of this 68,000 telephones on farms in Oklahoma are owned and maintained by the farmer. There are so many telephones on the average line that satisfactory service would be impossible even if the physical condition of the lines were such as to permit of it. Most of the lines are grounded, rusty wire, with frequent splices, the instruments are antiquated, and usually the batteries are run down. The farmers pay an average rate of less than fifty cents monthly to the telephone company for switching service.

I think we can conclude from our experience with this problem that the farmer, however good a farmer he may be, is not properly trained nor does he have the time to maintain the telephone lines that serve him.

As previously stated a small portion of the farm telephones in the state are furnished, owned and maintained by the telephone companies. The average rate charged for this service is $1.50 per month and this rate has existed since long before the world war. Based upon the present purchasing power of the dollar this rate is equivalent to 87c today. The company owned rural lines have, at this rate, been a financial loss. The revenue derived therefrom has not even approached the cost of furnishing the service and the companies have, naturally, been reluctant to develop it further.

For many years we have tried through Farmer line meetings and actual demonstrations to educate the farmer to handle his telephone business properly, and although considerable may have been accomplished in isolated cases, the general condition of the service lines in Oklahoma still remains unsatisfactory.

We have finally been led to the conclusion that the farmer cannot be made a telephone man, and if he is to receive adequate, satisfactory, and dependable telephone service the telephone companies must furnish, own and maintain the entire line and equipment.

Recognizing this, the telephone companies have made what I think to be the first really intelligent approach to the rural telephone service problem. This approach involved the determination of the following:

(1) What type of rural plant is most economical to build for this service that will meet the transmission requirements and mechanically resist storm loads and other causes of line failure without excessive maintenance costs.

(2) What is the most desirable maximum number of subscribers per line, considering the cost of construction, the quality of service needed and the traffic load.

(3) What rates will be necessary to permit of development of this service without burdening the companies or the subscribers.

My company has done a great deal of work on this problem during the last year and we have constructed a number of experimental lines. We have found that the solution of the problem is possible only through the application of telephone salesmanship and with something definite to offer the farmer, we are proceeding at once on a very extensive rural development program.

The service features of our proposed lines will be generally as follows:

They will be magneto metallic circuits designed to give satisfactory transmission on both local and toll calls; bridged or code ringing will be used generally and there will be no less than six, nor more than eight subscribers on a line. The lines and equipment will be maintained on the same schedule as our exchange stations insofar as practicable.

To furnish the farmer with this greatly improved service, a rate treatment somewhat different from the present $1.50 rate must be employed.

We are convinced that rural lines adjacent to the average or smaller sized towns can be made to pay a satisfactory return if a density of from three to four subscribers per pole mile can be obtained, and a base rate of $2.00 for residence and $3.00 for business applied to all stations within two miles of the initial rate area.

Due to the decreasing number of stations per pole mile, and the increased investment in plant, there must be added .25c per mile per month to the base rates for stations beyond this initial area. In the average case these rates will not earn a fair return on the investment but will cover the other costs of furnishing the service, and we expect future development to bring the average revenue high enough to pay a fair return.

We have definite plans to proceed with rural development and have appropriated $200,000 for this purpose during this year. Starting late in 1929 we had approximately 200 stations on this new rural basis by the end of the year and we expect to add during 1930, 1200 to 1500 more.

The rural telephone service is now the weakest link in the chain of universal telephone service, and every one in the telephone business should be extremely interested in strengthening this link. We find that those living in cities are generally interested in this rural development problem as they realize that better telephone service to the farmer brings him closer to town. We know that the average farmer is not now making the use of out-of-town toll service that he should, due to the impossibility of carrying on a satisfactory conversation. We are finding that the farmer generally has

(*Continued on page* 44.)

THE BELL TELEPHONE SYSTEM IS ORGANIZED TO GIVE CONSTANTLY IMPROVED SERVICE . . . QUICK, ACCURATE, EASY TO USE

What you want of the telephone . . . it is our business to give

An Advertisement of the American Telephone and Telegraph Company

When you order a telephone, you want it put in promptly. During the last five years the average length of time needed to have a telephone installed has been cut nearly in half.

You want quick and accurate service, free from trouble. Good as the service was five years ago, today there are a third less troubles per telephone. During this same period there have been marked increases in the already high percentage of perfectly transmitted conversations.

When you make a toll call, you want a prompt, clear connection. Five years ago 70 per cent of all toll and long distance calls were handled while the calling person remained at the telephone. Today all but a very small per cent are handled this way.

The Bell System is organized to give constantly improved service. Several thousand persons in the Bell Laboratories are engaged in research that improves the material means of telephony. The Western Electric Company, with plants at Chicago, Kearny, N. J., and Baltimore, specializes in the manufacture of precision telephone equipment of the highest quality. From its warehouses all over the country, it supplies the millions of delicate parts for Bell System apparatus.

The operation of the System is carried on by 24 Associated Companies, each attuned to the area it serves. The staff of the American Telephone and Telegraph Company is continually developing better methods for the use of these operating companies.

Your telephone service today is better than ever before. The organized effort of the Bell System is directed toward making it even better tomorrow.

German - Swedish Telephone Alliance

Ericsson and Siemens & Halske Interests to Operate Telephone System of Greece; Combine May Prove Powerful Competition for I. T. & T. If Carried to Other Fields

A defensive alliance has been concluded between the Siemens & Halske interests of Germany and the L. M. Ericsson Telefonaktiebolaget of Sweden against the International Telephone & Telegraph Corporation, according to cable dispatches from Europe.

Up to the present time, competition for foreign telephone concessions or contracts has been carried on aggressively by all three organizations. Prospects of an understanding between the German and Swedish groups was seen in their cooperation in acquiring a concession to operate the telephone system in Greece.

The Ericsson and Siemens & Halske companies are forming a jointly owned Greek concessionaire to operate the telephones in Greece and will share in the financing of the new concern. Both the German and Swedish manufacturing companies will receive shares in the new company's orders for apparatus and equipment.

Further Cooperation Expected

Obtaining of the Greek concession by the European group had been expected here, although officials of International have not commented on this development. The German electrical concern for some years has had friendly relations with the Greek Government. While there is no information as to the future course of the Ericsson-Siemens & Halske alliance, cooperation in other European countries would not be surprising to observers here.

The Ericsson Telephone Company is reputed to have the financial backing of Kreuger & Toll, which controls the Swedish Match and International Match companies. Ericsson has plants for the manufacture of telephone apparatus in Austria, England, France, Holland, Hungary, Italy and Spain as well as in Sweden, and has telephone concessions in some Argentine cities, parts of Italy, Poland and Mexico and in Smyrna, Asia Minor. It has construction and sales forces in numerous other countries.

Scope of the German Firm

Siemens & Halske manufacture the greater part of the telephone equipment used in Germany and have interests in the telephone business in several other countries. The German firm is well placed as regards patents for important telephone apparatus. The alliance of the German and Swedish groups would provide powerful competition with the International Systems if carried to other fields, particularly since both have been quick to adopt such American methods as proved to be important business getters, it is understood.

From a purely scientific standpoint, it is not believed that the advantages gained or lost by the International, Ericsson and German interests in securing new concessions or contracts will interfere with the progress of plans to link the telephones of Europe on a scale comparable to the Bell System here, inasmuch as long-distance equipment is standardized and can be connected up with any of the various types of manual or automatic telephony in use in a given city or country.

R. B. Still Joins Theodore Gary & Company

Announcement has been made that R. B. Still, Tyler, Texas, general manager of the Gulf States and Home City

R. B. Still

Telephone companies, and vice-president of Utilities Finance corporation, has resigned from these positions, his retirement to take effect July 15. Mr. Still has accepted a position in Kansas City, Mo., with the Telephone Operating and Acquisition organizations of the telephone and kindred businesses of Theodore Gary & Company throughout the United States. He will go to Kansas City to take over his new duties following the severance of his present connections.

Mr. Still has been connected with the Gulf States Telephone company since its organization more than twenty years ago, and it has been through his able management that it has been built up to one of the important utility companies in the Southwest with more than twenty exchanges in small towns. For the last ten years he has been president of the Texas Independent Telephone Association. He has become not only one of the prominent figures of Texas but has won national recognition as well.

United Telephone Buys 38 Indiana Companies

Sale of 38 telephone exchanges owned by Max F. Hosea of Indianapolis to the United Telephone Corporation of Abilene, Kan., has been announced at Indianapolis. The consideration was said to be in excess of $1,000,000.

The United Telephone Corporation owns the Flora telephone plant, having purchased the system last summer. Several months ago the company asked for an increase in rates from the Public Service Commission but action was deferred by the Commission until after certain improvements are made on the plant. Part of the material to be used on the improvements arrived here several weeks ago, the local manager reported.

All the properties except one are in Indiana. They include: Amboy Home Telephone company; Center Telephone company; Central Indiana Telephone company of Sheridan, Ind.; Converse Consolidated Telephone company; Ekin Mutual Telephone company; Greentown Telephone company; Home Telephone company of Noblesville, Ind.; and United Telephone company, operating at Andrews, Buck Creek, Burlington, Kirklin, Lagro, Matthews, Mt. Etna, Summitville and Upland, Ind.

Wise to Keep Telephone Wires High

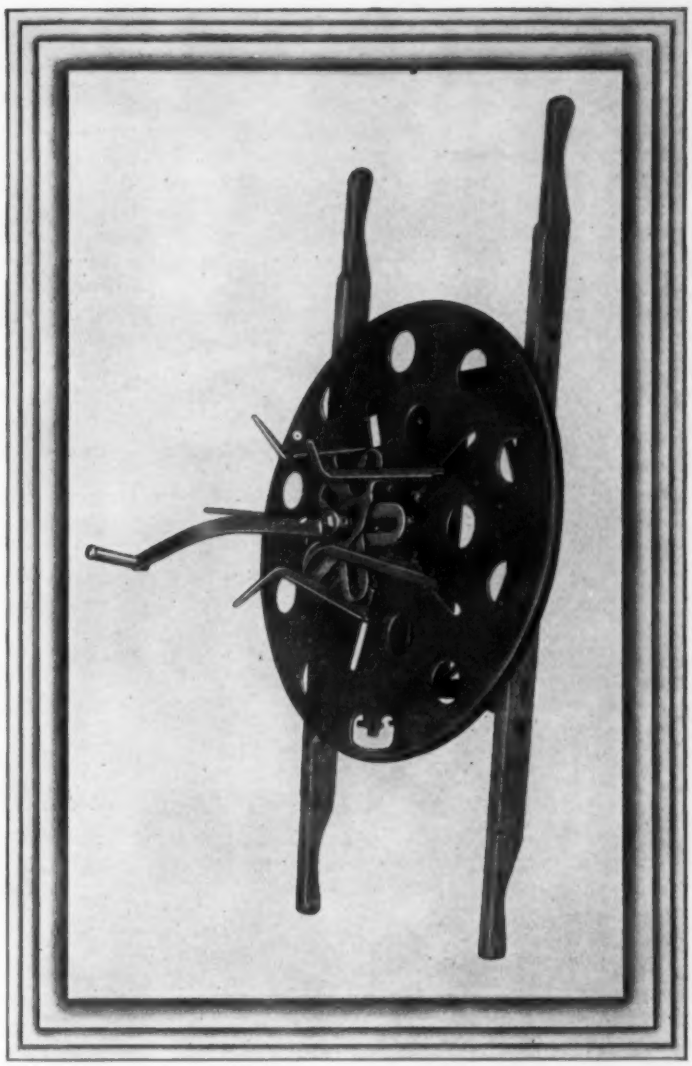
That a telephone company is liable for damages if accidents are caused by low-hanging telephone wires was proved recently at Prescott, Ia. The Prescott Telephone Company was sold at a sheriff's sale to satisfy a judgment of $5,240 awarded to the estate of Thomas Hubatka. Hubatka is alleged to have died as the result of injuries received when he was dragged from a load of hay by low telephone wires hanging across an intersection north of Prescott.

workmen who ask no wages

IF you could add a workman to your line crew with but small initial cost and no continuous salary—and that worker would save time, money, and not infrequently step in to protect the life of other workmen—wouldn't you do it in a hurry?

The Matthews Adjustable Reel for pay out and take up is that very necessary member to an efficient line crew. It does away with the expense of wooden reels, and the five arms can be adjusted to fit any wire coil in its size range. Pulling out and coiling on the reel can be done at the same time, which means a saving of time.

J709



The metal reel table can be grounded to afford a protection against live wires. An exclusive feature of four-roller bearings affords a smoothness of performance that makes the handling of wire on coils extremely easy. Can be supplied with or without brake and used in either vertical or horizontal positions.

MATTHEWS
ADJUSTABLE
REEL
for pay out and take up

W. N. MATTHEWS CORPORATION - *Engineers and Manufacturers* - ST. LOUIS, MO.

Ramblings

By J. A. S.

L. S. Gardner has been named president of the Texas Independent Telephone Association to succeed R. B. Still; the latter resigned to accept a position with Theodore Gary & Company. Gardner has been secretary of the Texas association for the past eleven years and knows almost every telephone man in the state, past and present. Gardner has all the qualifications for the job and with him at the helm the work of that organization should go forward without interruption.

* * *

The removal of R. B. Still from Texas will be regretted by every telephone man in that state, be he Independent or Bell connected. As manager of the Gulf States Telephone Company Mr. Still built up one of the best organizations in the country. The exchanges under his management were improved and modernized to where service was universally good, which was a record when it is remembered that a majority of them were run down and obsolete when taken over. But Still's friends will rejoice that he has connected himself with a reliable concern where greater possibilities are within his grasp.

* * *

And while we are talking about Texas and Texans, we want to say right here that Oscar Burton, who succeeds R. B. Still as manager of the Gulf States Telephone Company, will carry on the work of Mr. Still in that organization in a manner that will reflect credit to himself as well as the former manager. Burton has been assistant to Mr. Still for a number of years, and has shown executive ability in every instance. He also becomes secretary-treasurer of the Texas Independent Telephone Association, and his address is still Tyler.

* * *

Dr. C. L. Jones attended the meeting of the "Class A" companies in Chicago recently. He reports that his ninety-seventh dividend to stockholders of the Athens Home Telephone Company have been mailed out. Dr. Jones organized the telephone company at Athens, but do not get the idea that he has passed a milepost on the year's highway of time for every dividend; they are quarterly dividends, but at that—well, it's a heck of a lot of quarterly checks after all.

* * *

The Northern Indiana Telephone Association held its annual meeting at Wawasee Lake, Indiana, the latter part of June. This meeting is looked forward to by a number of telephone men, manufacturers and salesmen as a real outing as well as a business meeting and the 1930 convention was no exception to this rule. It's a real opportunity and if you are in driving distance you should not miss the next opportunity of attending this district meeting.

* * *

Wisconsin has finally set its convention date; Milwaukee is the city and August 5-6-7 the dates. It now becomes a mid-summer meeting instead of mid-winter. Last convention we'd planned to drive up to Madison, but snow reports caused us to hesitate; and it is well that we did. On the train from Chicago we ran into many places where snow had completely covered the fences and obliterated all highway marks. But shucks! Talk about snow now is enough to cause a riot. Why don't they hold the mid-summer meeting at one of the many beautiful lake retreats?

Straightforward Trunking Systems

(*Continued from page 20.*)

keys, one on the left and the other on the right side of the keyshelf and in a line with the ringing selection keys. These keys are exactly of the same construction as the ringing selection keys.

To the extreme right a similar key is mounted and is used for taking manual peg counts.

In front of all the common keys are flush type white designations properly engraved to designate their function.

The plug shelf is covered with black fibre and the keyshelf is covered with black formica, giving a continuous black finish. The piling rails in the face of the board are also covered with black formica.

Links Utilities in Four States

New grouping of utility properties in Missouri, Kansas, Arkansas and Oklahoma has been completed, according to H. L. Housley, vice-president of Municipal Telephone & Utilities Co. He stated that his company has acquired properties in these states, furnishing electric light and power, telephone, water, gas and other utility services to more than 75 towns and cities.

Companies included in the merger have formerly been under private operation and are: Associated Utilities, Inc.; Arkansas Electric & Water Co.; Central Telephone Co. of Oklahoma; North Central Telephone Co. of Missouri; North Side Telephone Co. of Missouri, and an independent telephone operating company in Kansas.

Oklahoma District Telephone Meetings

The second series of 1930 district telephone meetings of the Oklahoma Utilities Association will be held at Garber, Tuesday, September 9; Waynoka, Wednesday, September 10, and Thomas, Friday, September 12.

Vacation Telephone Schedule for Those Absent During the Summer

A number of telephone exchanges are giving a vacation rate to persons who will be absent from their homes during the summer for one month or longer. The vacation rate is, in most instances, half the regular rate. Many persons are taking advantage of this rate rather than having their telephones discontinued.

The service rendered for the vacation half rate includes continued listing of the telephone in the directory with no change in number, and giving information concerning the absent person's address and telephone to all who call his home number. The telephone is left intact for out-going calls, and when the person returns, a call to the exchange will restore the regular service without the charge of installing another telephone.

Independent Telephone Men Will Gather in Chicago

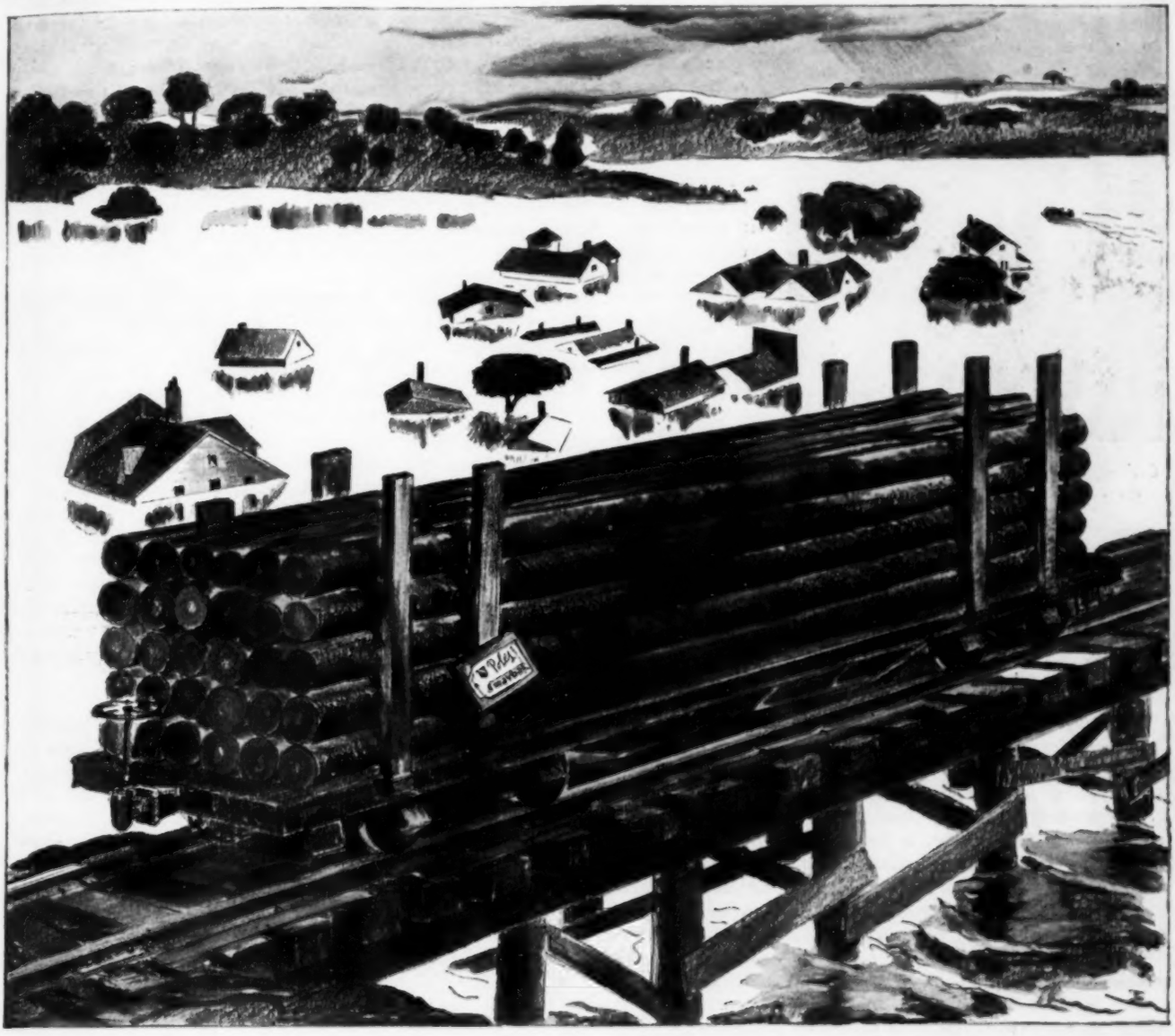
The United States Independent Telephone Association will hold its annual national convention at the Hotel Stevens, Chicago, October 14, 15, 16 and 17. Plans have been made to take care of the largest gathering of independent telephone men ever held. Although last year's convention broke all attendance records and boasted an enrollment of near 1,200 delegates, a larger number is expected to convene in Chicago.

Exhibits also are expected to surpass all those held before, both in quantity and quality, especially since the Hotel Stevens is amply provided with facilities for taking care of many exhibits.

Deaf Women Now Converse Over Telephone

Providing deaf persons know the rudiments of lip reading, they can now "hear" over the telephone by means of television. Experiments conducted in New York recently have proven this to be true. The "hearing" is accomplished by looking through a televisor on the telephone, and watching the face of the other person on the line, which is seen in natural colors.

The story of a Nationwide Construction Material Service . . . . . 1. EMERGENCY



The odyssey of flat car No. 14023 . . .

An Oregon valley was flooded . . . Before the waters had begun to subside a Graybar salesman had his home office on long distance . . . "Get me a carload of poles—*rush!*" was his terse order . . . And with that, flat car No. 14023 started on its odyssey. Tracks were out . . . bridges down . . . but the vigilant salesman "followed" his car as it was re-routed . . . and re-routed again . . . The car arrived. The poles went up. Service was restored . . . thanks to Graybar's readiness to meet *every* construction requirement . . . But Graybar's service on construction material is not confined to the unexpected. Graybar stands ready *every* day for *any* job . . . whether it be a mile of line, or a complete six months supply of all materials for a large utility.

OFFICES IN 76 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK, N. Y.

GraybaR

Tune in on the Graybar Program at 10 P. M. Eastern Daylight Saving Time, every Tuesday . . . Columbia Broadcasting System

Identify your inquiry to advertisers by saying—"As shown in TELEPHONE ENGINEER"

Telephone Storage Batteries

(*Continued from page* 31.)

open jar and breakage is less likely. Sealed type cells are all assembled and charged at the factory before shipping. The small types are filled with electrolyte while the larger ones are

Old style telephone battery installation. Note moisture on outside of cells.

shipped charged but dry due to their weight. The connection of cells at point of installation is a simple task as plates are charged and the initial charge after placing in service will not be as extended as with the open jar type when the cell is shipped knocked down.

With the old style open jar all the bolted connections on the bus bars were exposed to the full effect of the acid spray which in many cases caused corrosion resulting in a noisy battery and a noisy battery on a telephone system is not a trifling matter. Of course these connections were protected either by covering with vaseline, taping and painting and in many cases by burning the ends of the bus bars together. Even so in many instances corrosion and noise would develop. With the new sealed jar type batteries the spray being retained in the cell by a baffle and condensing chamber which permits the dry gas to escape the danger of corrosion is still further safeguarded by a recently designed lead covered copper ribbon connector with a new designed bolt connection for connecting to the negative post and the positive post where the corrosion is most likely to occur is firmly burned in place.

A task always dreaded around every telephone exchange and one that has caused more frayed shirt sleeves and cuffs than all others combined is the reading of the specific gravity and temperature with the old-fashioned floating instruments. I well remember an event which took place during the early years of my telephone experience. Every Saturday it fell to my lot to take an individual reading of the specific gravity and temperature of each cell, remove the glass covers, wash them, add distilled water to each cell, replace the clean covers and start what was known those days as the overcharge. Many's the shirt I have ruined in this way, and I remember the morning that I was removing the covers from each cell with one hand and stacking them up on the other. The wet plates did not stack well and they suddenly slipped striking the edge of one jar in the center at the top breaking it from stem to stern with neatness and dispatch. Some quick thinking and quicker action on the part of the Wire Chief kept the exchange in service by strapping out the broken cell, but his temper was horrible to behold and I came near terminating my telephone career then and there.

With the new sealed type cells the danger of jar breakage is reduced to nil and the reading of the specific gravity is made a pleasure by the use of the charge indicator which in most cases consists of two differently colored balls which gives more accurate readings than are possible by the use of commercial hydrometers. Often the space in a cell is not sufficient for the use of a floating hydrometer and it just sets in a crevice or sticks to the side of the glass jar and the readings are worthless. Whereas with the indicator balls which are built in a cage that provides needed protection for the movement and perfect acid circulation accurate and dependable readings are assured. Built-in thermometers also make temperature readings an easy matter as is indicated at all times and can be read at a glance. Never before have so many refinements been incorporated in a telephone storage battery which are all of benefit in the furnishing of dependable telephone service.

(*To be continued in the August issue.*)

Successful District Meeting Held at Galesburg

Fifty Illinois cities were represented at the Illinois Telephone Association meeting held recently at Galesburg, Ill., by 175 men. Speakers at the session were F. C. Woods, general manager of the Intra State Telephone Company, who commented on the operation of the telephone business; T. DeWitt Talmage, transmission engineer of the Illinois Telephone association, who spoke on the testing of subscribers' loops and stations; and A. J. Parsons, of Springfield, secretary and treasurer of the organization, who spoke on activities of the association.

Ohio Telephone Concern Installs New Long Distance Lines

Three new long distance telephone lines are under construction between Ada, O., and Lima, O., by the Suburban Power company, operating company for The Utilities Service company of Alliance, O. The Lima Telephone and Telegraph company is owned by The Utilities Service Company. It has been estimated that the completed lines will cost $12,000. Three miles of new telephone lines are also being installed between Ada and Alger, O., by The Suburban Power company.

Be sure to attend the Wisconsin Telephone Convention, Milwaukee, August 5-6-7.

"STEWART" DETECTO-METER

The "STEWART" Detecto-Meter is guaranteed to locate those bad joints that are sure to give trouble in hot weather. One Illinois company cut out two, one bushel crates of bad wire joints all showing resistance. They brought their lines up in transmission, beyond belief.

The Detecto-Meter will also measure resistance of any part of switchboard or telephone. It has more than 100 uses around the telephone plant. It is also a 150-volt voltmeter. Sent on trial. Price $39.00.

Also lineman's Test Sets with detector coil, Cable Testers and Test Cabinets.

STEWART BROTHERS, Ottawa, Illinois

DEPENDABILITY . . . long life . . . economical operating and maintenance costs are the reasons why the use of Exides is increasing in P.B.X. service.

EXIDE-IRONCLAD P.B.X. BATTERIES

Exide - Ironclad Battery, type B1-5, especially designed and constructed for P.B.X. service.

Exide BATTERIES

THE ELECTRIC STORAGE BATTERY CO., PHILADELPHIA

POWER

Rigid tests in laboratory and field conducted by railroads and public utilities have revealed the superior power of Ace and Victor Dry Cells. These batteries have been winning and holding a dominant place in the telephone field because of their longer, greater service.

BOND ELECTRIC CORPORATION
JERSEY CITY, N. J.
Chicago Lancaster Kansas City San Francisco

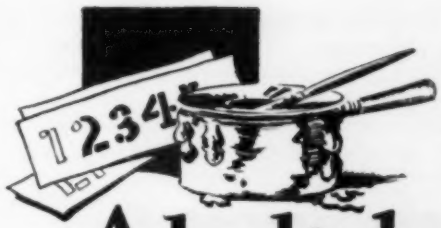
Dependable
NORTHERN WHITE CEDAR POLES
that offer *utmost* in Quality and Value.
Guaranteed Butt Treatments
MICHIGAN POLE & TIE CO.
NORTHERN AND WESTERN POLES
NEWBERRY, MICHIGAN
Reed City, Mich. YARDS St. Paul, Minn.

Get EVER-PROTECT aid in your construction.

EVER-PROTECT has proved practical and profitable in making many hundreds of cable installations underground without a conduit. It protects cable against storm damage, corrosion, chemical action, electrolysis and abrasion.
In liquid form EVER-PROTECT is great for overhead work, protecting your cable and messengers against chemical action and other destructive influences.
Ask your nearest jobber for complete details.

EVER-PROTECT CABLE COMPOUND
TRADE MARK REG. U.S. PAT. OFF.

National Cable Compound Co.
Incorporated
MITCHELL - - IND.



. Abolish the inefficient stencil, pot and brush.

USE
PREMAX
ALUMINUM
MARKERS

Faster Marking, Greater Visibility, Last a Lifetime

TELEPHONE companies all over the country have discarded the messy, unsatisfactory stencil system of marking poles, cable terminals, terminal boxes, and other properties, and now use Premax Markers.

They found, by test, that Premax Markers provided advantages which drove the old method into obsolescence. Premax Markers are easier to use, far more legible, are immune to the effects of weather, never need attention or replacement, and their first cost is extremely nominal.

Premax Markers appeal, instantly, to any telephone company official interested in more efficient and more economical property marking. They are made in sizes, types and symbols for every marking need.

The entire subject is completely covered in the Premax Book on Property Marking. Use the coupon today.

PREMAX PRODUCTS, Inc.
239 10th St., Niagara Falls, N. Y.

Send for Free Book on Property Marking

PREMAX PRODUCTS, Inc.
239 10th St., Niagara Falls, N. Y.

Please send a copy of Property Marking Systems for Public Utilities to—

Name .....

Company .....

Address .....

Kurtz Appointed General Manager

William O. Kurtz has been appointed general manager of the Illinois Bell Telephone Company, Chicago Area, the appointment to take effect July 1. Mr. Kurtz succeeds A. H. Mellinger, who has

W. O. Kurtz, General Manager, Chicago Area, Illinois Bell Telephone Co.

been elected vice president of the company in charge of operation.

Mr. Kurtz is a graduate of the Sibley College of Engineering, Cornell University, class of 1905, with the degree of M. E. He entered telephone work the same year in the Engineering Department of the New York Telephone Company and was associated with the Bell Telephone Company of Pennsylvania and the American Telephone and Telegraph Company prior to 1924 when he came to Chicago as chief engineer of the Illinois Bell. In 1928 Mr. Kurtz was appointed general manager of the State Area, which includes the territory of the company outside the city of Chicago.

Mr. Kurtz has been active in engineering society work and is now president of the Western Society of Engineers. He is also a member of the American Institute of Electrical Engineers.

Rural Line Development

(*Continued from page* 36).

not yet realized that the quality of his present service is consistent with the present cost, and that service of a quality that he needs to run his business of farming must involve a slightly greater expense.

As previously mentioned, the rural problem seems to us entirely one of salesmanship. The resistance offered by the farmer who has become accustomed to an inferior grade of service, although he has automobile, radio, electric power, farm machinery, etc., is sometimes very great, and real selling ability is necessary to show him where the increased cost of telephone service is justified.

However, the existence of the radios, automobiles, power machinery, etc., on the farms indicate the change that has been coming about in the farmer's economic and social life. The experience of light companies who have carried out very successfully programs of farm electrification is very encouraging. They have through splendid salesmanship, made the farmer realize that electric power would be worth more to him than its cost, even when this cost often meant a substantial outlay of money for line construction charges and a guarantee of monthly power consumption considerably greater than the amounts we are asking for telephone service.

On the whole, while our rural development and sales work is costing us considerable effort and expense at this time, we believe that within five years this service will sell itself.

By this time the Oklahoma farmer generally will be receiving the same quality of telephone service that is being furnished in the cities and he will be making such profitable use of this service in the business of running his farm that he will be gladly paying his share of the cost of operating the telephone property.

If you fail to read TELEPHONE ENGINEER advertisements you are the loser.

You owe your linemen this favor--

WE feel your company is no exception to the progressive spirit prevailing in the telephone field:—that of rendering co-operation to all employees.

You will read this advertisement. However, few, if any, linemen will see it. Because this magazine is essentially one for executives.

It is difficult to select advertising to reach the men in the field. Our folder (shown above) is of interest to linemen. We seek your permission to send your office enough copies to have one put in the hands of each of your men. (Or, if you prefer, we will mail copies on any list you may send us.)

A lineman who uses MASTER PLIERS will do better, cleaner, quicker work . . . with less wrist and arm fatigue . . . and with a tool that in ordinary service is unbreakable and which will give extraordinary long service.

We will be much indebted for your co-operation in this. We are quite sure your company will benefit, too—for your men will be better equipped for their work.

You may use the coupon; or write, if you prefer.

Thank you.

(Just now we have a special offer whereby a mechanic can try out Master Pliers before making a purchase.)

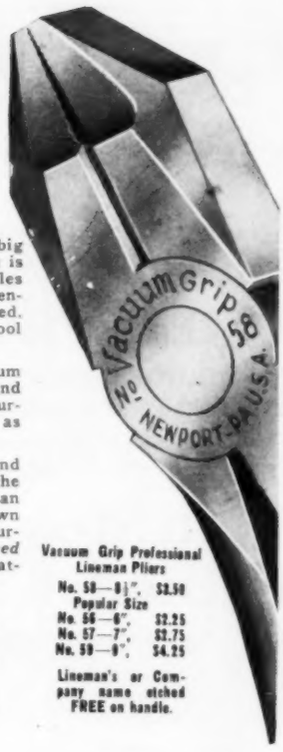
MASTER PLIER CORP., FOREST PARK, ILL.

SEND US.....OF YOUR CIRCULARS. TE7

NAME .....

ADDRESS .....

It pays to use "standard" tools



ANY tool that is "standard" has a big advantage over ordinary makes. It is dependable. It makes good. It enables the mechanic to do better work. It enables him to work with greater speed, saving valuable time. It cuts down tool expense, by reason of its long life.

All these things are true of Vacuum Grip Lineman Pliers, recognized far and wide among telephone lineman and purchasing agents of telephone companies as "standard" for line work.

The many features of superiority found in Vacuum Grip Lineman Pliers are the result of precision construction plus an unbeatably hard, durable steel—our own formula Molybdenum alloy electric furnace tool steel, *hardened and tempered thru and thru* by special liquid heat treatment and electric tempering.

***PURCHASING AGTS.** Send for samples of above for your men to use in running test. Write for Catalog showing over 50 Vacuum Grip patterns and sizes.*

FORGED STEEL PRODUCTS CO.
Newport, Pa.

Vacuum Grip Professional Lineman Pliers

No. 58—	8½",	$3.50
Popular Size		
No. 56—	6",	$2.25
No. 57—	7",	$2.75
No. 59—	9",	$4.25

Lineman's or Company name etched FREE on handle.

Vacuum Grip REG. U.S. PAT. OFF. **Pliers**

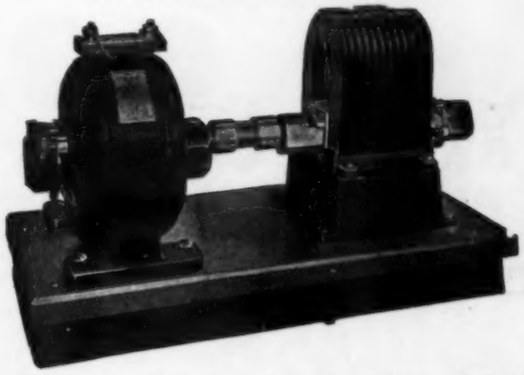
Built *UP* to a Standard—Not *DOWN* to a Price

OVER 600,000 IN USE

HOLTZER-CABOT

Magneto - Ringing - Motor - Generators

ALWAYS DEPENDABLE



These units effectively replace all old-fashioned hand and battery ringing methods. Extreme simplicity of operation and low cost offer advantages over all other devices.

Cuts operating expenses by eliminating expensive and troublesome battery equipment.

Make possible a swift, sure, carefree service that pleases both subscriber and operating company as well.

Can be supplied for any voltage or special current. A thorough test will convince you.

Complete data and specifications on request.

HOLTZER - CABOT ELECTRIC CO.

125 Amory Street, Boston, Mass.

6161 So. State Street, Chicago, Ill.

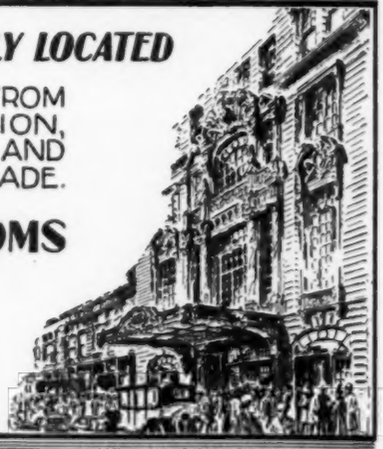
HOTEL *Famous for food*

CLARK ST. NEAR JACKSON BLVD.

ATLANTIC

MOST CENTRALLY LOCATED

ONE BLOCK FROM LASALLE STATION, POST OFFICE, AND BOARD OF TRADE.

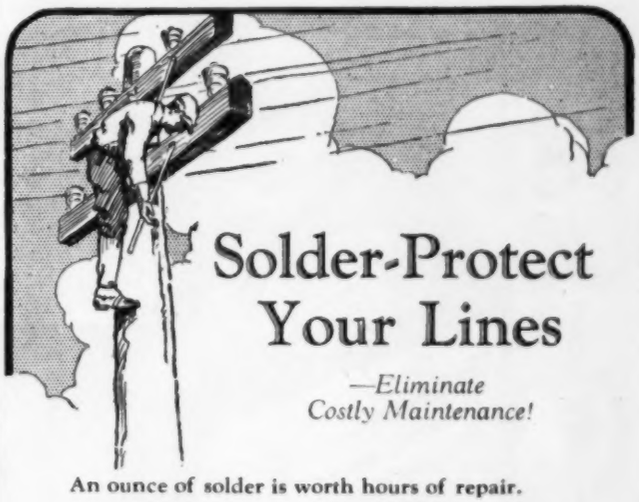


450 ROOMS

$2.00 UP

WRITE FOR FOLDER

CHICAGO



Solder-Protect Your Lines

—Eliminate Costly Maintenance!

An ounce of solder is worth hours of repair.

Every joint in a telephone system is a potential trouble-maker unless it is solder-protected.

KESTER ACID-CORE SOLDER on each outside connection makes any mechanical joint electrically secure. Solder all splices and bridges.

KESTER, with its self-fluxing features, cuts ordinary soldering time one-third.

FROM ALL JOBBERS

KESTER SOLDER COMPANY

4270 Wrightwood Avenue
Chicago, Illinois

RUNZEL-LENZ ELEC. MFG. CO.
ESTABLISHED 1904 **CHICAGO**

Specializing in Manufacture of

CORDS

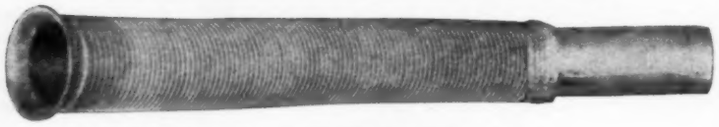
FOR ALL CLASSES OF TELEPHONE WORK

SIERRE EQUIPMENT CORPORATION
Los Angeles—San Francisco—Seattle—Pacific Coast Distributors

"Cope"

Flexible Metal Tubing with Bell Shaped Ferrule and Brass Nozzle which slips into the Duct.

Pull-in Guides for Lead Sheathed Cables



T. J. COPE, Inc.
Manufacturers of
Complete Equipment for Cable Installation
6122 Vine Street, Philadelphia, Pa. 19 So. La Salle Street, Chicago, Ill.

Made From Ohio River Fire Clay
Ohio River Fire Clay has long been recognized as superior for products where strength, and long life are required.
VITRICLAY conduits are the only duct made from this famous clay.
VITRICLAY
TORONTO
KAUL
OHIO
PRODUCTS
1. Smoot duct
2. Uniformly glazed
3. Properly vitrified
4. Finished with exactness and
"Straight as an arrow"
THE KAUL CLAY MANUFACTURING CO.
TORONTO, OHIO.

AMERICAN CROSSARM & CONDUIT CO.
14 Mills Main Office—Chicago, Ill. 73 Warehouses
Manufacturers and Distributors
CROSSARMS — FIR — Creosoted — Yellow Pine
Creosoted Wood Conduit
Pin and Brackets

Super-Service on rush orders!

If you are in a hurry your order can be loaded and on the way the same day we receive it. Quality poles since 1882 assures you of guaranteed stock and satisfactory dealings. Let us quote you prices.

Northern and Western Cedar
With or without butt treatment

NAUGLE POLE & TIE COMPANY
59 East Madison Street, Chicago
Branches: New York, Columbus, Kansas City, Spokane, Los Angeles, Boston, Madison.
Main Yards and Butt-treatment Plants: Minneapolis, Pinconning, Michigan, Spokane, Sand Point, Idaho, Seattle, Arrowhead, B. C.

Naugle Poles

Insure Your Overhead Lines

BY SPECIFYING

MacGillis

NORTHERN or WESTERN

CEDAR POLES

PLAIN or BUTT-TREATED
FROM

MacGillis & Gibbs Co.
120 E. Wisconsin Avenue
MILWAUKEE - WISCONSIN

Bell Cedar Poles
Piling & Ties
Western Red - Northern White
Creosote Butt Treating—Any Specification
Guaranteed N. E. L. A., W. R. C. A., N. W. C. A. Grades
Treating Plants and Concentrating Yards
Minnesota Transfer, Minn., Newport, Wash.
Other Concentrating Yards at British Columbia Points
There Are No Better Poles Than Those Produced by
BELL LUMBER & POLE CO.
Security Building Minneapolis, Minn.
Long Distance Phone Atlantic 2304

Takes the place of 6 men . . .
Simplex Pole Jack

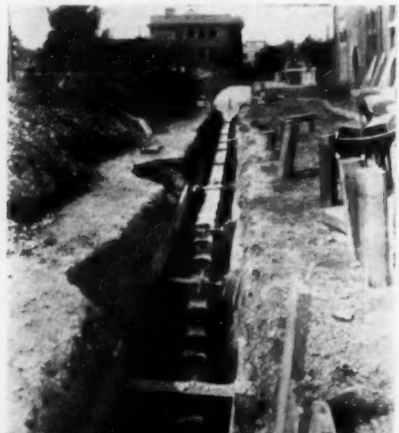
Templeton, Kenly & Co., Ltd.
Sole Manufacturers
Established 1899 Chicago, Ill., U. S. A.
Foreign Distributors:
International Standard Electric Corporation
Northern Electric Company, Ltd.

Cedar Poles
Northern White Western Red
Plain or Treated Butts
Prompt Shipment from Minneapolis Yard.
T. M. Partridge Lumber Co.
Minneapolis, Minn.

With the Manufacturers

Mitered Conduit Used in Crossing Viaduct

The Illinois Bell Telephone Company recently completed an engineering feat in laying cables at Aurora, Ill. They originally were faced with the problem of converting a duct bank two ducts wide and ten ducts high into a duct bank twenty ducts wide and one duct high, in order to pass over a viaduct without the need of a manhole. The old solution to the difficulty would have been the construction of a large and expensive manhole at each end of the viaduct and the costly splicing and training of twenty cables.



Natco slant or mitered conduit approaching and crossing a viaduct at Aurora, Illinois

However, the company solved the problem with a Natco slant conduit construction. The use of the mitered or slant conduit permitted the "fanning" or "splaying" of the vertical bank into a horizontal bank. The bottom courses of conduit were brought up to grade and run straight through. The successive courses were brought up to grade and fanned to positions side by side.

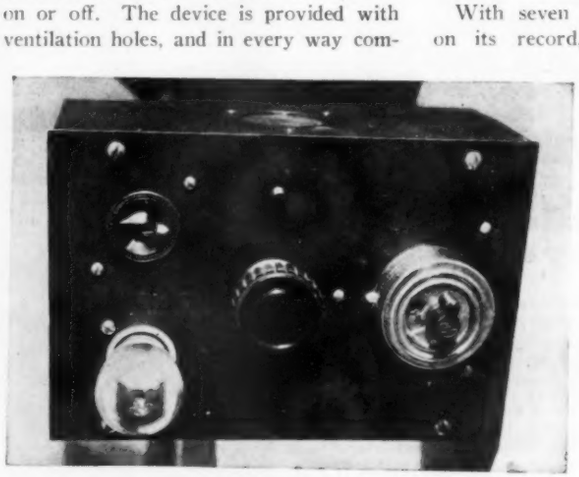
By means of these special clay conduit shapes, it is believed that the flexibility of underground construction can constantly be increased and at the same time the underground construction costs will be decreased.

Conduit for this and many other important engineering feats was furnished by the National Fireproofing Company, Pittsburgh, Pa., makers of Natco products.

An Electric Soldering Iron Control

Quick heating generally means excessive heating in the usual electric soldering iron, and excessive heating means premature burning out of the heating element, as well as frequent cleaning of the tip. While the quick heating feature is desirable, it is necessary to reduce the amount of current supplied to the iron once it has become heated, in assuring proper soldering temperature, minimum current consumption, and long and economical life for the iron itself.

In order to provide an economical control for the usual electric soldering iron, a simple device has been developed by the engineering staff of the Clarostat Mfg. Co., Brooklyn, N. Y. It comprises an iron box with the necessary knockouts for BX or conduit wiring, with a front metal panel carrying a switch, a knob controlling the soldering iron temperature, a pilot light, and a receptacle to take the usual attachment plug cap. The switch has three positions, namely: first, current off; second, full current on; third, reduced current on. To gain quick heating, the switch is snapped to the full current position. When the iron is heated the switch is snapped to the reduced current position, while the heat control knob is set for any desired degree of heat, depending on the work to be done. The pilot light indicates whether the iron is on or off. The device is provided with ventilation holes, and in every way complies with the underwriters' requirements.



It is claimed that the Clarostat electric soldering iron control will prolong the life of the usual iron at least six times. Furthermore, it effects a marked saving by eliminating frequent cleaning of the iron and providing an iron that is always ready for use.

R. C. Rottger, vice-president of the Indiana Bell Telephone Co. in charge of public relations, was recently elected vice-president of the Indianapolis Advertising Club.

Stromberg-Carlson Representatives Appoint J. B. Cummings, Jr.

Randall-Lore, Inc., Stromberg-Carlson representatives in Baltimore and Washington, have just announced that J. B. Cummings, Jr., has joined their organization as sales representative.

Mr. Cummings will cover Maryland and that part of Virginia and West Virginia served by Randall-Lore. Mr. Cummings has covered this territory for some time and has made a great many friends in the district.

C. H. North of Heston-North, Inc., Stromberg-Carlson representative in Cincinnati, made a special business trip to Louisville, Ky., last week. He reports that prospects for a big radio year in Kentucky are very bright.

C. D. Kinne, the busy assistant manager of Stromberg-Carlson's Kansas City office, recently dropped in at Lincoln, Nebr., and St Louis long enough to say "hello" to his many radio and telephone friends in those two places.

Stromberg-Carlson Has Strong Ball Team

With seven victories and one defeat on its record, the Stromberg-Carlson baseball team is repeating the wonderful showing it made last year when it was considered the best industrial team in Rochester.

This year the radio men have beaten some of the best industrial and semi-pro teams in Rochester. The last team they trounced was the Hart Stores Nine coached and managed by "Wicky" McAvoy, who was one of the best catchers in the major leagues when he played with the Philadelphia Americans.

The Stromberg-Carlson team is coached by Herb Kieso who several years ago made a name for himself when he pitched for some of the best semi-pro teams in the East. Kieso has been working his men hard all season, with the result that he has one of the smoothest working combinations in Western New York. Frank Walsh, formerly catcher for the Baltimore Orioles of the International League, is captain of the team, and R. L. Luker is business manager.

A brighter business future, apparently logically deduced from present facts, was forecast recently in an article appearing in "Business Week," a weekly magazine of business. The following has been taken from the article:

"The business tide reached its ebb during the past two weeks and is beginning to turn, very slowly and tentatively, in the face of a strong current of peevish, superficial and premature pessimism. There will be no noticeable change in the next few weeks.

"Progress will be slow, irregular, spasmodic, with sporadic relapses, successively less frequent and sharp, till the end of July. Then, in the same weeks when a year ago the downturn began, a decisive recovery will set in, general and definite.

"The rise of the business curve thereafter will be rapid, and will, as usual, steal a march on the slow-witted and self-centered stock market. By October it will be back to normal."

TRAVELERS select the Great Northern for its wonderful location in Chicago's "loop". They return because the large comfortable rooms, homelike environment, attentive service, excellent food and moderate charges make it an ideal hotel.

400 Newly Furnished Rooms
$2.50 a day and up

Sample Rooms
$4.00, $5.00, $6.00
$7.00 and $8.00

Dearborn St. from Jackson to Quincy
New Garage One-Half Block

Improved Tools

By Ray Blain.

When an old telephone man sees an improvement in an article which overcomes a defect that has worried him for years he experiences a thrill of extreme pleasure. Now take the small but always bothersome matter of cable pulling grips, I say bothersome because the old style although good, after being in use for an extended period always had a tendency to fray and break where the weave singles out for attachment to the pulling lug. At the point where the stranded wire passes over the sharp corners of the lead sheath the brunt of the strain and wear strikes and it is no small wonder that this is the weakest part of the grip and the first to develop trouble. Friction tape was tried at this point but was found to be slow, bothersome and of very little benefit.

Now I note with pleasure that a progressive manufacturer has come out with a new type grip that has this point of excessive wear covered with a new flexible steel bead protection giving a new wearing surface by rotating on the shoulder. I never thought that I would see the roller bearing principle applied to the lowly cable grip but it seems to be as effective here as on the most expensive automobile.

Yes the heart of the old lineman is glad for after years of complaining of the inefficiency of his tools it seems that his prayers are being answered by the progressive manufacturers who are eliminating his worries by new designs in tools and material.

Rumania in Phone Deal

Bucharest.—After many delays and an eleventh-hour cancellation, the cabinet accepted today an offer of the International Telephone & Telegraph Co. and J. P. Morgan & Co. for a $20,000,000 loan in return for a twenty-year monopoly of Rumanian telephones.

The government declares it is more acceptable on fourteen points than a rival offer by the Blair-Siemens-Ericson group and others. Objections of military authorities, which once threatened to prove insuperable, now have been overcome.

Set Dates for District Meetings

The Oklahoma Utilities Association has scheduled three district telephone meetings for September. They will be held respectively, at Garber, September 9; Waynoka, September 10; and Thomas, September 12.

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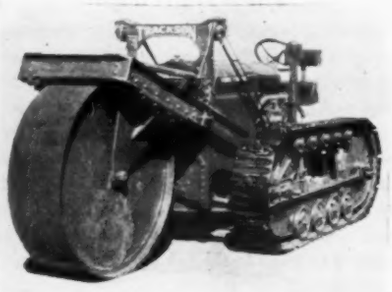
New Trackson Trench Roller

Of special interest to telephone companies and all others who lay conduit pipe is the new Trackson Trench Roller, illustrated here, which is manufactured by the Trackson Co., Milwaukee, Wis.

This roller provides a simple, effective and economical method of packing down dirt over newly laid pipe lines, as is required in almost all cities. It eliminates hand tamping and other slow, expensive methods and therefore is finding tremendous favor among public utilities superintendents, engineers, municipal officials and contractors. Also, it meets with the hearty approval of city inspectors because it puts back all of the dirt, except that which is displaced by the pipe, and leaves the ground as firm and solid as it was before the trench was dug. Thus the need for gravel refills is eliminated and at the same time there is no danger of the soil's settling later and cracking



The new Trackson trench roller which eliminates hand tamping and puts back all of the dirt

pavement which may have been laid over it, or causing other damage.

Almost unbelievable savings are possible with the Trackson Trench Roller, as has been proved by the machine's performance on the jobs of public utilities companies in various parts of the country. A single unit replaces as many as 20, or even more, laborers with hand tampers, in addition to saving the cost of gravel refills and other maintenance work. It costs very little to operate and maintain the equipment and only one man, the driver, is required. On the average job one of these units will roll as much as 2600 linear feet of 4-ft. trench before it is rolled. The first layer should be from 10 to 20 inches in depth, depending on the nature of the soil, and the rest of the dirt is usually rolled in 6-inch layers.

The Trackson Roller is exceptionally strong and well built. It consists of a wide steel roller filled with concrete, which weighs from 3,000 to 4,000 lbs., the weight varying to meet the requirements of different soil conditions. For average jobs a 3500-lb. roller is recommended. The roller is built for mounting on the Model DH Trackson McCormick-Deering crawler tractor, shown in the illustration, which has proved the ideal power unit for this kind of work. It's wide, sure-footed tracks easily straddle the trench and its very light ground pressure (less than 4½ lbs. per square inch) eliminates the danger of time-delaying cave-ins.

Interchangeability is a feature of Trackson front-end tractor equipment, and since the mechanical hoisting assembly of the Trench Roller is identical with that of the Trackson Shovel and the Trackson Bulldozer it is an easy matter to detach any one of these machines from the crawler tractor and mount another in its place. Thus a single power unit may be used for a variety of purposes.

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Kellogg No. 28 desk set (old type heads) complete with W. E. 3-bar 1000-1600 or 2500 ohm external post connection signal set @	8.00
Kellogg No. 28 desk set with unbreakable head complete with W. E. No. 315 inside connection 5-bar 1000-1600 or 2500 ohm signal set @	10.00
Leich Elec. desk set complete with W. E. 3-bar 1000 or 1600 ohm external post connection signal set $7.75—4-bar @	8.75
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Kellogg No. 79 C. B. Induction coils @	.40
Western Elec. No. 22 3-bar Bdg. Generators with cranks @	1.65
Stromberg 4-bar A. C. or Pulsating current Gen. with crank @	2.25
Automatic Elec. Slip type Receivers with New W. E. Shells & Cords @	1.10
Kellogg Local or C. B. Transmitters complete with backs @	1.10
Western Elec. No. 323 Transmitters complete with backs @	1.25
Western Elec. No. 143 Receivers complete with cords @	1.25
Western Elec. No. 240 External post connection 3-bar 1000-1600 or 2500 ohm Bdg. magneto hotel sets with W. E. Trans. & No. 122 Rec. @	5.75
Western Elec. No. 240 external post connection 3-bar 1000-1600 or 2500 ohm desk set signal sets with No. 13 Ind. Coil @	4.50
Western Elec. No. 315 inside connection 3-bar 1000-1600 or 2500 ohm desk set signal sets @	5.75

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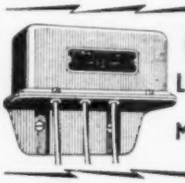
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No. 6 and No. 8 2500 ohm Biased Ringers	1.00

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